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SALT LAKE CITY ALTERNATIVE
TOSCO SHALE OIL PRODUCT PIPELINE

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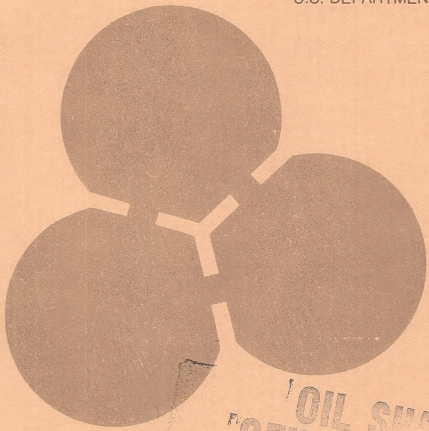

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The following people formed the core team for actual preparation of the report.

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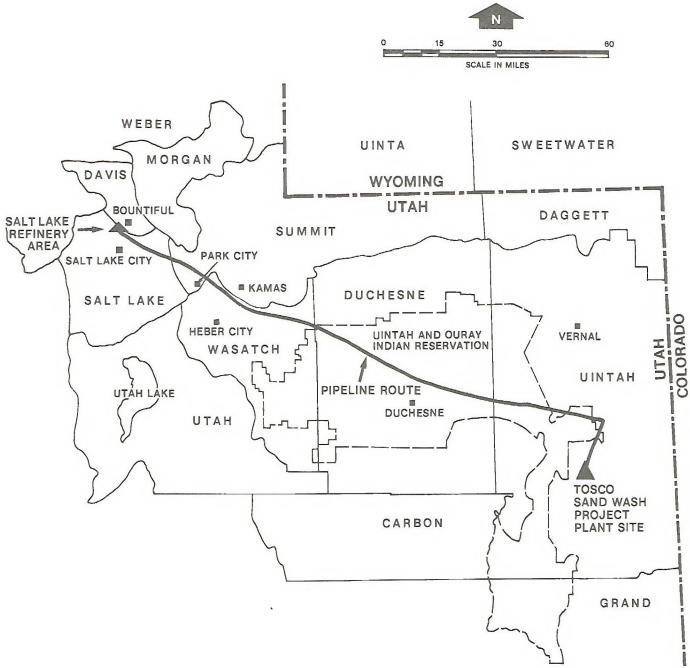
Chapter 1: SALT LAKE CITY ALTERNATIVE PRODUCT PIPELINE - PROJECT DESCRIPTION

Tosco Development Corporation (Tosco) proposes to construct and operate a shale oil processing plant at the proposed Sand Wash site in the Uintah Basin. Tosco proposes to deliver hydrotreated shale oil by pipeline from the proposed Sand Wash Site to the vicinity of Rangely, Colorado. The proposed shale oil pipeline to the Rangely, Colorado, area would intersect the potential LaSal pipeline and the hydrotreated shale oil would likely be transported to the Midwest for refining by way of existing interstate pipelines from Casper, Wyoming. An alternative destination for delivery of hydrotreated shale oil would be Salt Lake City, Utah, also via pipeline. If the pipeline were to extend from the Sand Wash site to Salt Lake City, the hydrotreated shale oil would be refined there. The precise destinations would be determined as marketing opportunities become better established.

This technical report focuses on the product pipeline alternative which would extend 160 miles from the pump station at the proposed Tosco Sand Wash site in the Uintah Basin to the existing refinery area north of Salt Lake City. It presents information and analysis of a one-mile-wide corridor with three general segments: (1) from the Tosco Sand Wash project site north-easterly for about 9.8 miles to the existing Chevron oil pipeline, (2) generally following the existing Chevron oil pipeline for about 141 miles west to Dry Creek Canyon (northeast of Salt Lake City), and (3) generally following an existing Mountain Fuel gas pipeline for about 9.2 miles form Dry Creek Canyon to the Salt Lake refinery area. The general location of the alternative pipeline is shown on Map 1, General Location Map. Milepost configurations are identified on Map 2 (located in the inside back cover pocket). This is the same map found in the Uintah Basin Synfuels Development Draft Environmental Impact Statement, Map T-1-2 (BLM 1982).



MAP 1

GENERAL LOCATION MAP:
SALT LAKE CITY ALTERNATIVE PRODUCT PIPELINE

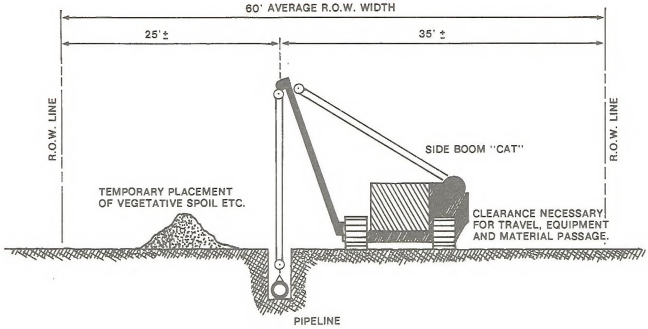
Although a 1-mile wide corridor was studied, the actual construction and permanent right-of-way for the pipeline would average 60 feet in width. Less right-of-way width would be available through agricultural lands in Kamas Valley, on National Forest lands, and in urbanized areas where actual right-of-way widths would depend on adjacent or associated land uses and land use constraints. Although an average 60-foot wide right-of-way was used for analysis purposes in this report, it should be recognized that continued planning, design and right-of-way acquisition would undoubtly result in refinement of actual right-of-way widths. Such refinement would be expected to involve variations which would not appreciably alter the 60 foot average width; therefore, they would be of the same general order of magnitude as the alternative pipeline discussed herein. It is noted, however that specific segments could have a permanent right-of-way width as narrow as 10 feet or, on the other extreme, have temporary rights-of-way of 60 to 250 feet. Portions of the Tosco right-of-way could overlap with the existing Chevron right-of-way, if this was required by land management agencies or private landowners. At the major river crossings, approximately 250 feet (parallel to river) by 450 feet would need to be cleared on each side of the crossing to provide temporary working areas.

1.1 PROJECT DESIGN AND CONSTRUCTION

Tentative plans call for a 12-inch diameter (12.75 inch outside diameter) underground pipeline. Pipe specifications (i.e., size, wall thickness, design pressure) would be designed based on an initial volume of approximately 50,000 barrels per day (bpd) of shale oil. The pipeline would be buried underground a minimum of 4.5 feet deep (3 feet frost depth plus 1.5 feet of insulation). The pipeline would be designed in compliance with applicable Federal regulations. The pipe would also be manufactured in accordance with appropriate American Petroleum Institute specifications. Pipeline wall thickness would vary with location in order to match hydraulic requirements. The range of operating pressures would be between 1,600 and 1,800 pounds per square inch (psi).

The hydraulics of the pipeline system would require a pump station located at the Sand Wash plant site from which the alternative would originate. The proposed pump station located inside the plant's storage and loading facilities, would boost the shale oil pressure to the established operating pressure (1,600 - 1,800 psi). The pump station would be equipped with two 2,000 horsepower electric motor driven pumps, each having a capacity of 50,000 bpd. Only one pump would be operating at any one time; the second pump would be a back-up. A pump station which would be located southwest of Myton (MP 44) and another northwest of Hanna (MP 88) also would be included. Equipment at these two pump stations would be similar to those found at the Sand Wash pump station. Three acres of land outside the right-of-way would be required for each of the two in-line pump stations. These acres would be needed to accomodate pump station facilities, including a fenced-in security area.

It is anticipated that ordinary pipeline construction methods would be followed, as depicted on Figures 1 and 2. Engineering design work (now in progress) would define specific information pertaining to detailed construction techniques (i.e., type of access, equipment to be used, and materials), schedules, and personnel requirements for pipeline installation.



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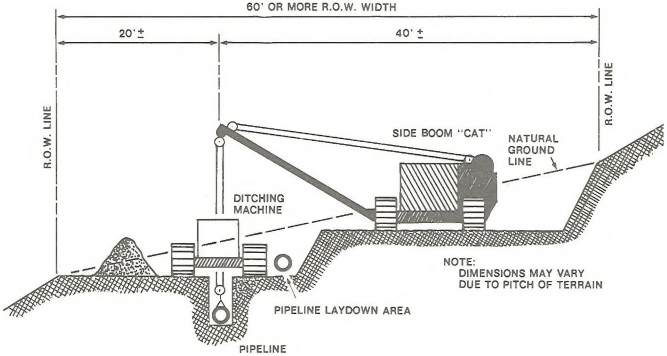


— CROSS SECTION ON SLOPING TERRAIN —

SOURCE: USDA 1974a

FIGURE 1

CONSTRUCTION METHODS

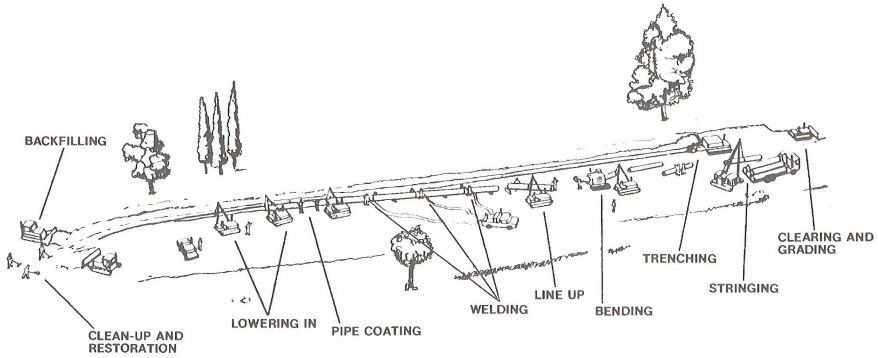


FIGURE 2

TYPICAL PIPELINE CONSTRUCTION SPREAD

If this alternative is selected, construction would proceed after Tosco obtained the necessary rights-of-way, permits, and other authorizations (see Authorizing Actions section of the Uintah Basin Synfuels Development Draft EIS). The construction would occur in a sequential pattern along the right-of-way. On completion of centerline staking, clearing and grading, and trenching pipe would be delivered to the right-of-way and accurately strung in the length required, minimizing the accumulation of short lengths. Trucks would be utilized for hauling the pipe and in most cases would proceed along the cleared right-of-way.

The pipeline layout would conform to the terrain and fit the contour of the ditch both vertically and horizontally. Pipe bends would be made in the field as conditions warrant except for special bends which are predesigned for use in special areas such as stream crossings, and abrupt changes in terrain. Standard welding practices would be followed including the swabbing of pipe joints from all internal contamination (such as earth, sand, loose mill scale, and other extraneous material). All welding would conform with the requirements set forth in the American Petroleum Institute specifications.

After welding has been completed and before the pipeline is lowered into the trench, all parts of pipe not previously coated and wrapped would be cleaned, primed, and coated. Any damage to the manufacturer-applied coating would be repaired.

Pipe casings would be installed, as required, at points where the pipeline would cross railroads and major public roads. Seals would be installed at the ends of each casing to prevent moisture from entering. Insulators would be installed at regular intervals along the pipeline to prevent electrical shorts between the pipeline and casings. The casing would be vented to the atmosphere for normal aspiration, leak detection, and prevention of casing seal rupture in the event of a leak in the pipeline.

Before the pipeline is lowered into the trench, the trench would be cleaned of rocks, hard dirt clods, and any roots or extraneous material or objects. Earth pads would be placed as bedding to support the weight of the pipe and provide clearance between the pipe and the bottom of the ditch on straight runs, provide clearance along overbends, and allow snug fit of pipe at sags. Any rock bottom ditch which is ragged would require earth padding between pipe and ditch bottom.

The entire pipeline would be coated and wrapped to protect against corrosion. Integrity of the finished coated system prior to backfilling would be tested, adjusted, and maintained in accordance with standards of the Research and Special Program Administration Office of Operation and Enforcement - U.S. Department of Transportation (U.S. DOT). Electrolysis test stations would be installed at all crossings with other pipelines, at all cased road or railway crossings, at all buried insulation flanges or special insulated fittings, and elsewhere as necessary.

The pipe would be lowered into the prepared trench with the use of side boom tractors utilizing slings of sufficient width to avoid pressure damage to pipe coatings. Cathodic protection installations would be installed as the final

operation of lowering. The installation would be inspected by U.S. DOT before backfilling.

The backfilling operation would closely follow the laying of the pipe. During the backfilling operation, standard construction procedures would ensure that no rocks, hard clods, or other hard objects would fall on the coated pipe. The pipe would be covered with soft earth containing a mixture of soil and small rocks, to an appropriate depth before any rocky material is placed in the ditch. With the ditch backfilled to the level of the surrounding ground, the fill would be compacted. The remaining surface soil would be spread evenly over the disturbed area.

During the backfilling on hillside or sloping ground, furrows or terraces would be provided across the pipeline right-of-way to direct the flow of water into natural drainage courses away from the pipeline.

All waste material would be accumulated and disposed of in authorized disposal sites. Woody plant materials including branches, shrubs, and tree trunks, would be run through a chopper, reduced to a small size, and distributed over the right-of-way to provide mulch material for later revegetation (refer to Chapter 4 for details on revegetation and restoration procedures). Portable sanitary facilities would be provided for construction crews as work proceeds along the right-of-way.

Immediately following the backfilling operation, the right-of-way would be cleaned. All surplus and defective materials would be removed and transported to a preselected disposal area. Both sides of the pipeline ditch would be graded and returned to its original contouras practical. Temporary fills, culverts, and bridges would be removed and the area returned to preconstruction state, as nearly as possible. Seeding of grasses and/or forbs would be done if desired by the landowner and as required by Federal and State land management agencies and the Ute Indian Tribe.

It is anticipated that the alternative pipeline extending from the Uintah Basin to Salt Lake City could be constructed within 2 years. Due to harsh winter conditions in the Wasatch Mountains, construction work would be limited generally from April through October. About 100 workers would be needed to construct the pipeline for approximately 14 months.

During operation of the pipeline, the shale oil product would be monitored at Sand Wash for temperature, flow rate, and pressure. Pressure alarms would be used to immediately notify operating personnel of possible upset conditions (refer to Appendix A for detail on follow-up actions). Sump tanks to accommodate flow from relief valves and oil strainers placed in the product line would be located at each relief valve facility. The sump tanks would have alarms and volume level switches to prevent overflow. All critical valves in the system would be remotely controlled. Mainline valves would be placed at various intervals along the pipeline in accordance with applicable U.S. Department of Transportation regulations (49 CFR 195). Tentative locations of the valves are identified in Appendix A.

After the projected life of the project (35 years), the pipeline would be left in place (with surface facilities such as pump stations removed) or it would be excavated for re-use if salvage value warranted. The disturbed surface would be restored to preconstruction conditions as nearly as possible.

Additional descriptive details for the pipeline are found in Appendix A and in the Tosco Sand Wash Project Description Technical Report (1982).

1.2 ENVIRONMENTAL CONSIDERATIONS INCLUDING APPLICANT PROPOSED MITIGATING MEASURES

Construction of the pipeline system would be in compliance with all applicable water pollution control, water quality, air pollution control, and air quality laws, regulations, and standards. Tosco would consider specific features and practices for construction and operation of the pipeline, in order to reduce environmental impacts and to minimize potential pipeline leaks. Some of these measures would apply to the entire pipeline length, while others would be needed only for selected segments and geographic areas.

These items are considered to be applicant proposed mitigating measures:

1. The centerline alignment would be planned to minimize impacts to vegetation and to minimize soil disturbance. The centerline of the pipeline would be staked prior to clearing and grading, and the right-of-way boundaries would be delineated.

2. Existing roads and trails would be utilized to the fullest extent practical, to move equipment, materials, and work force. Access roads and construction areas would be sprayed with a suppressant to decrease fugitive dust as necessary and when effective. The quality and quantity of vehicular emissions would be controlled by vehicle type and frequency in the affected area in accordance with appropriate Federal and State regulations.

3. New permanent or temporary roads would require 1) spraying to decrease fugitive dust; 2) avoidance of sensitive areas such as floodplains (seasonal construction); 3) use of chemical stabilizers or specific construction methodology on roads that are frequently travelled; 4) proper contouring of disturbed areas to control erosion and mulches, outrow dikes, and contour furrowing to control runoff; and 5) planting and seeding vegetation native or adapted to the area which would stabilize the soils and reduce erosion. Woody vegetation material which was removed prior to construction of roads would likely be chipped and used as mulch.

4. If private roads and bridges were used, permission would be required from owners, tenants, or lessees and the roads and bridges would be maintained in a safe and usable condition. Any damage caused by such use would be promptly repaired.

5. The pipeline right-of-way width would be cleared only of those aboveground obstacles which would prevent the performance of work. The cleared area would be graded to permit transit and operation of construction vehicles and equipment and to permit placement of the pipeline at the desired

elevation. However, the applicant would do as little grading of the right-of-way as possible to minimize disruption of existing vegetation. Steep slopes and areas with high erosion potential would be avoided wherever possible.

6. The right-of-way would be graded in a manner to minimize interference with existing land surface drainage patterns. Existing major drainage would not be blocked by the ditching operation. Temporary culverts would be provided wherever necessary across the ditch and openings in the spoil bank to keep the major drainage routes open. Grading would be finished to maintain the original drainage or water flow conditions as nearly as practicable.

7. Pipeline construction at river crossings would not be undertaken during periods of high flow (usually late spring). Normally, construction of crossings would be accomplished within two weeks. During construction of river crossings, the drainage or storm runoff from river bank staging areas would be controlled via detention basins, evaporation ponds, or straw bale filters to prevent discharge of suspended solids, and grease or oil in concentrations exceeding State of Utah water standards.

8. Every effort would be made to minimize the effects of construction on water flow. Wherever possible, the gradient of the stream would be restored upon completion of construction; stream banks would be restored to resemble their original grade, and breakers or riprap would be placed over the pipeline where necessary for erosion control along river banks. The pipeline would be weighted with concrete to offset buoyancy and to ensure that the pipeline would remain in the underwater ditch.

9. The method of crossing streams and roads would be determined by the nature of the terrain, geology, and the stream or road. Driving, boring, and excavation would all be considered on a case by case basis when crossing streams and roadways. A typical river crossing is schematically illustrated in Figure 3.

10. Pipeline casings would be utilized at all road crossings where required by Federal and State agencies and the Ute Indian Tribe and at all railroad crossings. At all road crossings, the pipeline would be buried a minimum of 4.5 feet.

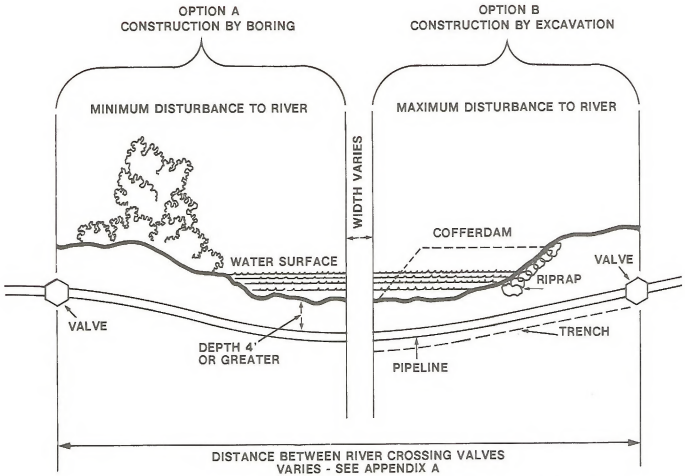


FIGURE 3

TYPICAL RIVER CROSSING

11. Specific precautions would be taken to prevent damage to any underground structures (e.g., other pipelines, cables, conduits) that may be encountered along the pipeline route. In placing the pipeline beneath intersecting pipelines, trenching depth would provide appropriate clearance between the two pipelines. The depth of trenches across or adjacent to roads, highways, railways, drainage ditches, irrigated land, and areas requiring river crossings, would depend upon the requirements of each landowner and any public or private authority having jurisdiction.

12. Pipe strung on the right-of-way during construction and prior to trenching and lowering in would be placed to permit the normal passage of livestock, wildlife, and equipment across the right-of-way.

13. Pipeline corridors would be double-trenched. Excavated material would be stockpiled in designated areas which would be protected from vehicular travel, erosion, and drainage channels. Upon completion of construction, stockpiled materials would be replaced so that available plant growth soil material would be on the surface. The surface would then be cleaned, plowed, harrowed, or disced using construction equipment. This would create small ridges containing moisture which would protect seeds from wind and erosion. A more detailed reclamation plan, including site-specific removal and stockpiling of materials, would be developed based on detailed soil studies performed by Tosco prior to initiating construction activities.

14. Any filled areas which would be necessary for a pipeline base or access facilities would be thoroughly compacted and stabilized to minimize erosion. These areas would be contoured so as not to adversely affect the use or appearance of the filled and surrounding area. Soil erosion would be controlled by use of temporary check dams, diversion dikes, riprap, and/or restoration of natural slopes, (including reseeding where suitable conditions would permit).

15. Plant species and planting ratios would be selected from those growing naturally in the area. Any well-adjusted introduced species which would be carefully considered for long term usefulness. Seeding or planting would be used where soils and climatic conditions suggest success of such practices.

16. Significant impacts to wildlife would be minimized through the use of seasonal construction periods and engineering techniques including rerouting of the pipeline. A field survey would be completed prior to construction of the shale oil pipeline to identify specific locations which should be seasonally avoided due to a high wildlife impact potential.

17. Cathodic protection facilities would be provided for corrosion control.

18. Oil skimmers would be available for transport to any areas where a spill could enter a water course.

19. The entire pipeline would be hydrostatically tested to a minimum of 125 percent of maximum operating pressure in compliance with U.S. Department

of Transportation safety standards. Water for hydrostatic testing would be obtained through agreements consistent with local, State, and Federal regulations and ordinances. Approximately 50 acre-feet would be required for testing. The test water would be disposed of in accordance with Federal, State, and local agency requirements.

20. After construction, access to the pipeline at the principal intersections of existing or new permanent access roads would be restricted. Natural topographic barriers, rock debris, and fences, if necessary, would be used to control unauthorized access. Access for emergency repairs or maintenance (e.g., pump station, valves) would be limited to existing or new permanent roads unless extraordinary conditions warranted otherwise.

21. During routine aerial inspection of the pipeline which would continue for the life of the pipeline, Tosco would monitor erosion control and revegetation in accordance with a monitoring plan. In the event some settling of the backfilled trench or excessive erosion occurs, steps would be taken to control the erosion.

1.3 LAND REQUIREMENTS

The 160-mile long alternative pipeline right-of-way would involve about 1254 acres, with seven ownership categories as shown on Table 1. Land ownership, by category and pipeline mile post, is given in Appendix B. The private sector, the largest single category of lands within and along the alternative pipeline corridor, would account for about 67 percent of the total land ownership along the pipeline route. The majority of private lands occur from Kamas Valley west to the Salt Lake City refinery area (Map 1). Chevron Pipeline Company indicate there are over 200 different private land owners along the pipeline corridor. These maps were last updated in 1972, and some private lands have probably changed ownership since then. Since additional growth has occurred in both the Salt Lake City and the Uintah Basin areas, it is doubtful that the total number of land owners has decreased. Private lands which would be crossed by the alternative are used primarily for agriculture, grazing, commercial development, suburbs, and scattered residential areas.

Approximately 19 percent of the alternative pipeline corridor would cross tribal and allotted Indian lands of the Uintah and Ouray Indian Reservation, (MP 0 through 85). These lands are administered jointly by the Ute Indian Tribal Business Committee, the Ute Tribal Resource Division, and the Uintah Ouray Agency of the Bureau of Indian Affairs (Cuch 1982a).

The pipeline corridor would cross 2 miles of the Ouray National Wildlife Refuge which is located 30 miles southwest of Vernal, Utah. One mile would cross land leased from the Ute Indian Tribe, with rights for land uses (other than those associated with the Refuge) held by the Tribe. The 11,400 acre refuge would be bisected by the pipeline corridor (Map 2). Established in 1961, the refuge represents one of the newest of more than 300 national wildlife refuges, and supports peak fall and spring waterfowl migration populations of up to 75,000.

Table 1

TOSCO'S SALT LAKE CITY ALTERNATIVE PRODUCE PIPELINE

Land Status (Miles of Land Crossed)

Ownership Category	Miles	Percent of Total Length
BLM	2	1
Forest Service	18	11
State	2	1
Private	105	67
Indian Alloted[a]	2	1
Indian[b]	29	18
Fish & Wildlife[c]	2	1
	160	100

[a] Land within the Uintah and Ouray Indian Reservation that was allotted to members of the Uintah and Ouray Tribe under the Allotment Act of 1905 (Private lands of inheritance).

[b] Uintah and Ouray Tribal land (Reservation land).

[c] Land acquired by Department of the Interior for Ouray National Wildlife Refuge. (Includes 1 mile of land leased from the Ute Indian Tribe.)

The alternative would cross 2 miles of public lands administered by the Bureau of Land Management (BLM). These lands are managed locally through the BLM Vernal District Office (Map 2).

The Uinta and Wasatch National Forests represent 8.8 percent (14.1 miles) and 2.4 percent (3.9 miles) respectively, of land ownership along the pipeline corridor. These lands are managed locally through the Uinta and Wasatch Forest Supervisors' Offices.

1.4 SCOPING - ISSUES AND ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

As originally proposed, the Tosco Salt Lake City Alternative Pipeline would generally parallel two existing 10-inch diameter pipelines along the Chevron pipeline right-of-way. One pipeline was constructed in 1948 and the other in 1958. An initial review of that right-of-way identified the following potential conflict areas and issues related to new pipeline construction:

1. White River crossing
2. Green River crossing
3. Ouray National Wildlife Refuge
4. Duchesne River crossings
5. Uintah-Ouray Indian Reservation resources and impacts (including Rock Creek crossings and associated fishing values, and crossings of canals and ditches)
6. Kamas Valley agricultural land
7. Upper Parley's Canyon watershed
8. Emigration Canyon impacts and alternatives
9. Salt Lake City urban development (Fort Douglas, University of Utah, Residential areas, City Creek Canyon)
10. Potential future pipeline needs and corridor congestion

Personal contacts then were arranged with various city, county, state, Ute Indian Tribe, and Federal officials to obtain views and comments on these items. As a result of the input received from those people listed in the acknowledgement section of this report, it was determined by the core team that the list could be narrowed somewhat, based on the following information.

The crossings of the White, Green, and Duchesne rivers would not be a significant problem to endangered fish provided that the measures to protect the fish species were implemented, as set forth in the list of mitigating measures provided by the Fish and Wildlife Service (Gill 1982). (See Chapter 4 - Mitigation Measures.)

Construction of a raised roadbed may be needed for the pipeline due to wetland development. Incorporation of a raised earth berm through a portion of the Ouray National Wildlife Refuge could facilitate refuge plans to create a resting and perching area for water fowl and other birds on the east side of the Green River (Troester 1982).

The pipeline could cross the Uintah-Ouray Indian Reservation subject to decisions by the Tribal Council. Representatives from the tribe requested that this technical report identify two separate classifications of land:

Indian Tribal Lands and Indian Allotted Lands. In addition, the Tribal representatives expressed these concerns regarding the pipeline:

- protection of a scenic geologic area immediately north of the proposed Sand Wash project site (approximately MP 8);
- protection of wild horses along the east end of the pipeline route;
- minimization of conflicts with any Ute Tribal grazing lands through MP 90;
- avoidance of conflicts with potential irrigation development along Leland Bench (MP 19 through MP 34) and any existing irrigation systems that could be affected (this area eventually could come under Tribal administration with circle irrigation systems as part of the Central Utah Project);
- toxicity of shale oil product to the surrounding area if a spill occurred (the tribe requests the installation of an "oil spill skimmer" for pollution control on all river crossings);
- protection of the West Fork of the Duchesne River during construction and operation of the pipeline because of the high fishery value to the Tribe along the river (six crossings would be involved);
- avoidance of potential conflicts with planned waterfowl development (near MP 48) as part of the Bonneville/Upalco Unit of the Central Utah Project;
- protection of existing irrigation developments and irrigated lands near Rock Creek (MP 68) and protection of critical deer winter range in that area;
- avoidance of conflicts with Tribal coal lease areas and phosphate properties (near MP 84) where there are Tribal mineral rights under State-owned lands; and
- general protection of soils and wildlife.

There are currently problems with agricultural land in the south end of Kamas Valley and the existing Chevron pipeline right-of-way, where some interruption of normal farming practices occurs. Disturbance and disruption of shallow soils in this area adversely affects irrigation, drainage, and farming. In discussion of alternatives with Kamas Soil Conservation District officials, the study team (and Tosco) was advised to keep the alternative pipeline within the existing Chevron right-of-way (MP 112 through 122) to avoid further disturbance to the area.

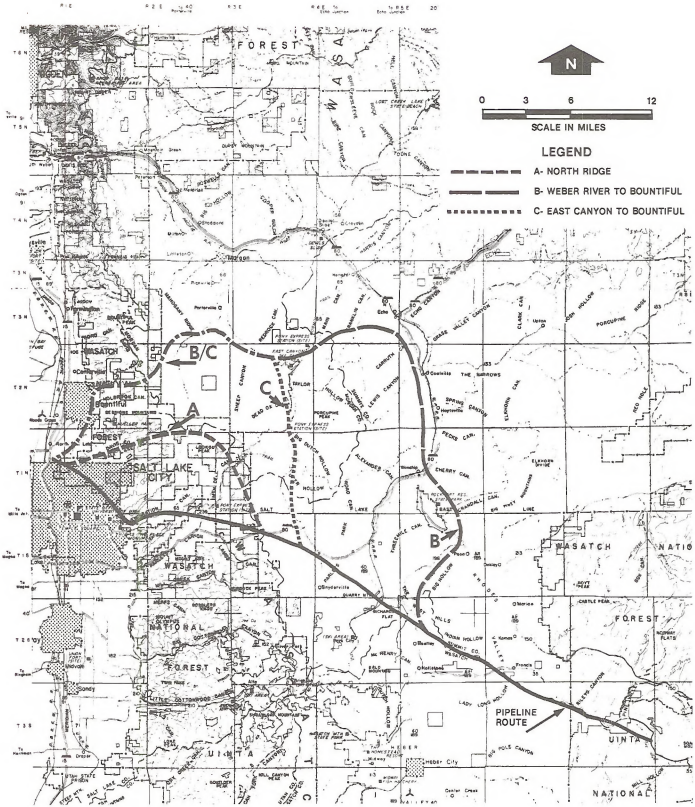
The headwaters of Parley's Canyon (MP 140 through 143.5) comprise part of the main water supply for Salt Lake City. Concern was expressed by the Salt Lake City Water Department and Planning and Zonging Commission regarding potential degradation of water quality and loss of domestic water supply. Such potential impacts to the existing Mountain Dell Reservoir and the proposed Little

Dell Reservoir were presented to the study team, along with possible future pipeline relocation needs. The two Chevron oil pipelines and the Mountain Fuel natural gas pipeline presently located in upper Parley's Canyon would require relocation of certain segments in order to construct the potential Little Dell Dam. The issues in Parley's Canyon could be resolved by proper erosion control measures, revegetation, and suitable right-of-way selection to avoid future relocation.

Impacts to Emigration Canyon and alternatives were given considerable attention by the study team and by many of the people contacted. Views of both city and county planning officials were obtained since Emigration Canyon is the subject of a local controversial annexation discussion. The environmental setting of the canyon is discussed in Chapter 2 of this technical report.

The proposed route in Emigration Canyon would involve disturbance issues and land use conflict issues. Residents are generally opposed to further land disturbance within the canyon in order to safeguard remaining natural values. Subdivision developers desiring to expand residential facilities within the canyon are opposed to "pass-through" facilities which might impose constraints on local subdivision plans or complicate local utilities in canyon areas where access and/or utility congestion already exist. City and county planning officials indicated that it would be physically possible and acceptable (from a permitting viewpoint) to construct the Tosco pipeline along a carefully selected route through the canyon provided that suitable mitigation plans were included; however, the public issues previously noted would continue to exist.

In order to avoid the canyon, the study team identified three variations to the alternative pipeline route from the mountains to refinery area north of Salt Lake City. These variations are noted as A, B, and C on Map 3. These variations were investigated and briefly analyzed.



MAP 3

VARIATIONS CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Variation A - The variation would leave the existing Chevron right-of-way near the Summit County line (MP 139) and generally follow the Salt Lake and Davis County lines along the ridge north of Salt Lake City. In discussions with Salt Lake County and Wasatch National Forest representatives, it was found that construction difficulties over several miles of talus slope and induced potential for serious, uncontrolled off-road vehicle impacts in the important local watersheds would be major constraints. Such constraints cast a strong doubt on the viability of this route.

Variation B - The variation would leave the existing Chevron right-of-way in the West Hills (MP 127), paralleling the Weber River in a corridor analyzed in the Rocky Mountain Pipeline EIS (BLM and FERC 1981). From that corridor located near Coalville, the variation would extend west to Bountiful paralleling an existing Mountain Fuel natural gas pipeline. This pipeline route has been analyzed in two environmental assessment reports (USUF 1973; USDA 1974a). The route was not analyzed further because of the availability of these previous studies, the greater pipeline length (about 40 miles longer than the Emigration Canyon route), and constraints which would be encountered through urban development in the Bountiful area.

Variation C - This variation would be similar to Variation B but of shorter length. Rather than follow the proposed Rocky Mountain Pipeline corridor, the route would leave the existing Chevron right-of-way near Parley's Summit (MP 137) and extend north to East Canyon Reservoir where it would join the the existing Mountain Fuel natural gas pipeline route described for Variation B. Although this variation would be about 20 miles shorter than Variation B, it would conflict with recreation and planned resort values in East Canyon and would have the same problems as Variation B in the Bountiful area.

Potential issues with Salt Lake City urban development may be subdivided into the following four specific areas:

Fort Douglas - The study team found that this potential issue does not exist. The pipeline would cross lands formerly part of the military reservation, but that these lands were relinquished and transferred to the State in 1967. The lands are now administered by the University of Utah. Pipelines, a road, and a powerline from Fort Douglas to Red Butte Canyon would need protection during pipeline construction.

University of Utah - The alternative would cross University land adjacent to several buildings and through several unpaved parking areas where future campus expansion may occur. In discussion with University officials, it appears that the pipeline could be placed in a narrow corridor which would not conflict with existing or potential campus development, provided that the alternative pipeline was placed within the existing Chevron and/or Mountain Fuel pipeline rights-of-way and that the actual pipeline location was coordinated with the future extension of 11th Avenue (i.e., pipeline under roadway) on the northeast side of the campus.

The existing Chevron pipeline route coincides with 11th Avenue for a considerable distance through the northern part (Avenues Section) of Salt Lake City. Because of probable extensive disruption and conflicts to existing

underground community facilities, the alternative proposal was adjusted to parallel an existing Mountain Fuel gas pipeline farther north. Because of the construction of the Mountain Fuel pipeline, the alternative would require very careful siting, construction, and site restoration in order to avoid disruption to residential units in the vicinity of Chandler Avenue. Even so, foothill construction is becoming an increasingly controversial issue.

City Creek Canyon would be crossed by the alternative about 1.5 miles downstream from the existing water treatment plant. Protection would be needed for three buried water pipelines, buried telephone lines, and electrical power transmission lines connecting the water treatment plant to the developed urban area. In addition to being designated as a watershed, City Creek Canyon has historic and natural significance to many Salt Lake City residents. Based on the past experience of City Water Department project proposals, any new construction within the canyon would be a major local issue. Such an issue would likely continue, regardless of environmental impact mitigation measures and post-construction restoration plans which may be imposed.

The Wasatch Mountains which extend in an east-west direction in Utah present a limitation on the development of linear facilities, such as the alternative pipeline. Mountain passes and Wasatch-front canyons have limited space because of terrain features and are becoming increasingly congested with transportation corridor development. Concern has been expressed that new pipelines be planned with long-range considerations included, to make fully effective use of the limited corridor space. In this regard the alternative product pipeline must be viewed with the following future considerations:

1. Although the pipeline from the Uintah Basin to the Salt Lake refinery area is considered as an alternative to Tosco's proposed Rangely pipeline plan, it needs to be considered in light of whether one or more future shale oil pipelines to Salt Lake City would be required. If needed, such pipeline(s) could be built as a common carrier by Tosco or by one or more other companies involved in the Uinta Basin Synfuels developments.

2. Shale oil could be processed (i.e., hydrotreated) onsite to about the same degree by each of the various project developers in order to utilize a common carrier pipeline. (Shale oil products processed to significantly differing levels of refinement could not be intermixed in a pipeline and still be satisfactorily handled at the refineries).

3. The Uintah Basin oil shale and tar sand development potential is large. The Uintah Basin Synfuels EIS production scenarios of 121,000 barrels per day (bpd) and 320,500 bpd suggest that substantial amounts of shale oil must be transported from the Uintah Basin in one or more directions to east or west market locations. Conceivably, the figures cited in these scenarios could be exceeded in the long-range future with additional leasing of shale areas and as the synfuels industry matures.

4. A discussion with the division manager of the Chevron Pipeline Company (Lewis 1982) revealed the following information pertinent to oil pipelines between the Uintah Basin and the Wasatch Front.

a. At present, the two 10-inch Chevron pipelines (with more pumps than presently on line) and the 8-inch diameter Amoco pipeline from Wyoming could supply the existing refineries along the Wasatch Front to 98.9 percent of full capacity, i.e., current pipeline capacity (with more pumps added) would meet Salt Lake City refinery capacity. Apparently, refinery capacity (155,000 bpd), not pipeline capacity, is the main constraint to the rate at which hydrotreated shale oil could be brought to the Wasatch Front.

b. At present, the Wasatch Front refineries are operating at about 94,000 bpd, or about 61 percent capacity (which is also about the current national average due to diminished demand). The production of the Rangely crude oil field now served by the Chevron Pipeline Company is rapidly declining in the secondary recovery phase. It was indicated that some of the refineries likely would be wanting to process hydrotreated shale oil to replace the decreasing Rangely supply and/or to increase refinery outputs if future demand increases.

c. The two Chevron pipelines are currently being utilized at a combined rate of about 58,000 bpd. With additional pumps the pipelines would have a total capacity of 110,000 bpd. The difference between total pipeline capacity and current pipeline uses is close to Tosco's planned initial production volume of approximately 50,000 bpd.

d. Shale oil could be pumped through the same lines as other oils but not at the same time. The pipeline company would pump different oils in batches, each batch of pumping lasting several days.

e. Apparently, the west coast market areas are saturated and would not, in the foreseeable future, require oil from the central Rocky Mountain area. Unless conditions change, which would require expansion of Salt Lake area refineries, it seems that most shale oil produced in the Uintah Basin could (with the future construction of the potential LaSal pipeline, according to a recently completed industry study) be transported to the midwest (Wood River, Illinois) and southern parts of the country (Midland, Texas) for refining and further distribution. It appears unlikely that shale oil would be brought to the Wasatch Front in any great quantity (beyond about 110,000 bpd) for refining and distribution.

f. The Amoco pipeline from Wyoming supplies 43,000 bpd or 28 percent of the total pipeline capacity which serves the Salt Lake refineries. In the event oil from Wyoming were no longer transported to the Salt Lake refineries and the population of the Salt Lake/Southern Idaho areas continued to grow, then an additional pipeline could be required to supply fuel stocks from the Uinta Basin to the Salt Lake refineries.

5. The analysis of impacts for the 12-inch diameter alternative pipeline would be applicable to a common carrier pipeline of larger size, in as much as the mile-wide corridor is the basis for the environmental data

presented. It should be recognized, however, that specific construction impacts (i.e., acres disturbed, etc.) may be somewhat greater (estimated at 10 to 20 percent increase) than described due to the need to excavate a wider trench and use heavier equipment to lift and place a 20 to 30 inch diameter pipe than to construct a 12 inch diameter pipeline. Temporary rights-of-way outside the 50 foot wide right-of-way could be needed at some locations to facilitate construction of a larger pipeline.

While it is not possible to identify the precise needs for future pipelines in the limited mountain/canyon corridor zones, the matter remains a concern and will become increasingly critical as development in and around such zones continues. The same situation will continue in the urban areas of Bountiful and Salt Lake City, and in the suburban development areas of Emigration Canyon and Parley's Park where corridor restraints are becoming progressively restrictive to future cross-country pipeline and power transmission line construction. Each future project would be analyzed if proposed; no cumulative analysis of future projects (as yet unknown) has been attempted in this report.

1.5 METHODOLOGY AND STUDY LIMITATIONS

This technical report has been prepared using a scoping approach and analysis methods in line with the preparation of environmental impact statements (EIS), following general direction provided in the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations. Study methodology for each resource specialty follows common practices but is not explained in this report. The report focuses on information, rather than elaboration of the methods used.

Public scoping meetings for the Uintah Basin Synfuels EIS were held in Vernal, Rangely, and Salt Lake City on August 4, 5, and 6, 1981. Additional scoping specifically related to the Salt Lake City Product Pipeline Alternative was carried out by contacts with the various interests listed in the acknowledgements. Since the Uintah Basin to Salt Lake City Shale Oil pipeline is identified by Tosco at this time as an alternative to the company's preferred pipeline route to Rangely, Colorado, this technical report study for the Tosco pipeline does not include detailed information regarding individual property owners or other private citizens who may be affected by the alternative. The study reviews environmental factors within a 1-mile wide corridor, rather than a specific centerline route. Should this alternative corridor be selected, additional refinement in detail and coordination would occur in the centerline selection and right-of-way acquisition process by Tosco.

Additionally, the potential impacts from refining of the hydrotreated shale oil at the Salt Lake area refineries is not analyzed here because of the many uncertainties involved, such as:

1. It is not known which refineries would handle all or part of the shale oil.

2. It is not known how (or how much) blending would occur with existing refinery product processing.

3. It is not known to what extent shale oil processing would be additive to existing refinery outputs or whether feed stock now obtained elsewhere would be replaced.

Although some future refinery modification or expansion may occur as a result of shale oil production and transportation to the Salt Lake refineries, the study team has not pursued this aspect because it is not a part of the proposed action as presented by Tosco. As noted previously, the nature and extent of any refinery changes are unknown. Should changes occur, only a small percentage of additional land use impacts to the existing, disturbed, industrial area, and any additional requirements for pollution control (i.e., air quality and water quality) would be considered by the respective regulatory agencies.

The study in this technical report is based on existing available information obtained by literature search, file data, and personal communications. Other than coordination and reconnaissance trips, new field investigations were not carried out by the Forest Service or BLM in the preparation of this report.

1.6 ENVIRONMENTAL IMPACT ANALYSIS

This report describes the affected environment, the environmental consequences (impacts), and mitigation measures associated with the product pipeline alternative.

An environmental impact analysis for an EIS focuses on those impacts of significance, as determined by the following criteria:

(1) it is considered controversial;
(2) it is of high public interest or concern;
(3) it substantially affects the human environment; or
(4) it is protected by law.
(BLM 1981d)

This technical report basically follows this same focus. Although not all the information in the report has an equally high importance level, it is essential to the full understanding of the major environmental subjects addressed.

Chapter 2: SALT LAKE CITY ALTERNATIVE PRODUCT PIPELINE - AFFECTED ENVIRONMENT

The existing environmental conditions along the mile-wide study corridor are presented by resource category in the following narrative and are charted by milepost on the Resource Profile and Data Sheet (Figures 4 to 10).

LINEAR PROFILE KEY

The following are environmental profiles of the product pipeline routing corridor. The mileposts correlate with those in the pocket map located at the end of the book. To determine the environment of a milepost in the pocket map, find the corresponding milepost on the following profiles and read the environment from the bars below the milepost.

LAND OWNERSHIP

- BLM Bureau of Land Management
- FS Forest Service
- I Indian Tribal Lands
- IA Indian Allotted Lands
- P Private
- S State

POLITICAL SUBDIVISION BY NAME
(County as indicated)

PLANNING UNIT BY NAME

WATER (Stream & River Crossings)

Flow Class

- P Perennial
- I Intermittent

Flood Plain

- FP

VEGETATION

- C Cultivated
- AG Annual Grasses
- F Forest
- MB Mountain Brush
- PJ Pinyon-Juniper
- R Riparian Crossing
- SG Saltbrush-Greasewood
- SS Sagebrush-Saltbrush
- S Sagebrush
- G Perennial Grasses

THREATENED OR ENDANGERED (T&E) PLANT/HABITAT

- H T&E Habitat

SOILS (Association/Rehabilitation Potential/Erosion Hazard)

Associations - Soil of

- 1 High Mountains - usually moist (Wasatch and Uinta)
- 5 Mountain Plateaus - usually moist (Wasatch)
- 21 Mountain Valleys - usually dry during part of summer (Wasatch and Uinta)
- 24 & 25 Mountain Plateaus - usually dry during summer (Wasatch)
- 27 Lake Terraces and alluvial fans - usually dry during part of summer
- 51 Desert Flood Plains and Terraces - usually dry in all parts
- 55 Rough Broken and Stony Desert land - usually dry in all parts
- 63 Desert Valleys, Benches, Terraces, and Alluvial Fans - usually dry in all parts

Soil Rehabilitation Potential

G	F	P
(Good)	(Fair)	(Poor)

Erosion Hazard

H	M	L
(High)	(Moderate)	(Low)

LINEAR PROFILE KEY (Cont'd)

TERRESTRIAL AND AQUATIC WILDLIFE

1. Critical cold water/trout habitat
2. High priority cold water/trout habitat
3. Substantial cold water/trout habitat
4. Limited cold water/trout habitat
5. Limited channel catfish habitat
A Antelope (fawning area)
D Deer (critical area)
E Elk (critical area)
W Waterfowl
M Moose (critical area)
SG Sage grouse (critical area)
ST Sharptail grouse (critical area)

SPECIAL ANIMALS AND THREATENED AND ENDANGERED WILDLIFE SPECIES

6. Critical Aquatic T&E Habitat
BE Bald Eagle (endangered)
GE Golden Eagle (nesting area)
H Wild Horse (critical area)
R Raptor Area (mitigation area)
WC Whooping Crane (endangered) Flyway

LAND USE

R Residential
A Agriculture
G Grazing
W Watershed (Domestic water supply)

AREAS OF SPECIAL CONCERN (A.O.S.C.)

Wilderness (W)
Wilderness Study Area (WSA)
RARE II Area
Scenic Highway
Recreation Site
Residential and Municipal Development (RMD)
Mineral Development
National Wildlife Refuge (NWR)

CULTURAL RESOURCES

( ) No. of sites eligible for National Register

PALEONTOGOGICAL RESOURCES

H Potentially High Significance
M Potentially Medium Significance
L Low Significance
N Negligible Significance

TRANSPORTATION FACILITIES

A Above ground pipeline
F Federal Highway
I Interstate Highway
L Light duty paved road
P Powerline
R Railroad
S State Highway
T Telephone cable
U Unpaved road

VISUAL RESOURCES

Existing Visual Resource Management Class/Visual Quality Objective

BLM VRM Classes and Corresponding	Forest Service Visual Quality Objectives
Class 1 (Natural)	P - Preservation
Class 2 (Changes not evident)	R - Retention
Class 3 (Changes subordinate)	PR - Partial Retention
Class 4 (Changes dominant)	M - Modification
Class 5 (Rehabilitation needed)	MM - Maximum modification

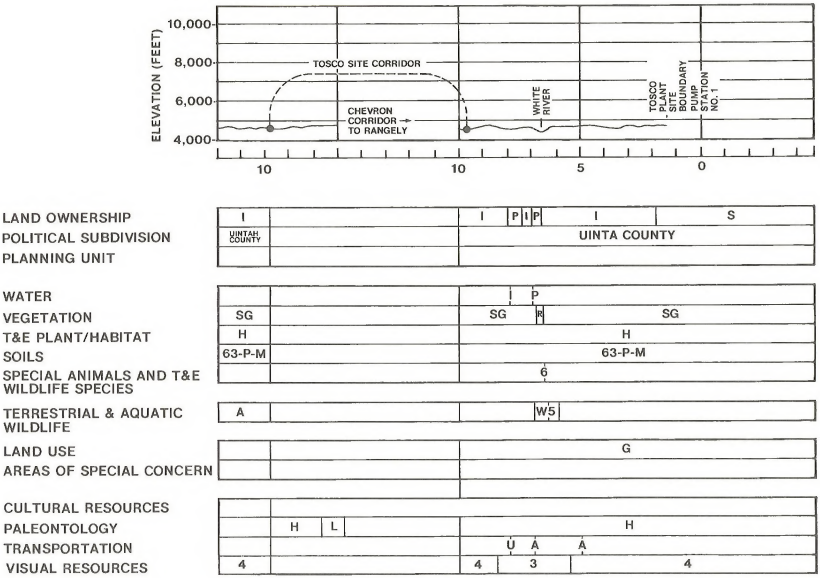


FIGURE 4

PROFILE AND DATA SHEET
SAND WASH TO MILEPOST 10

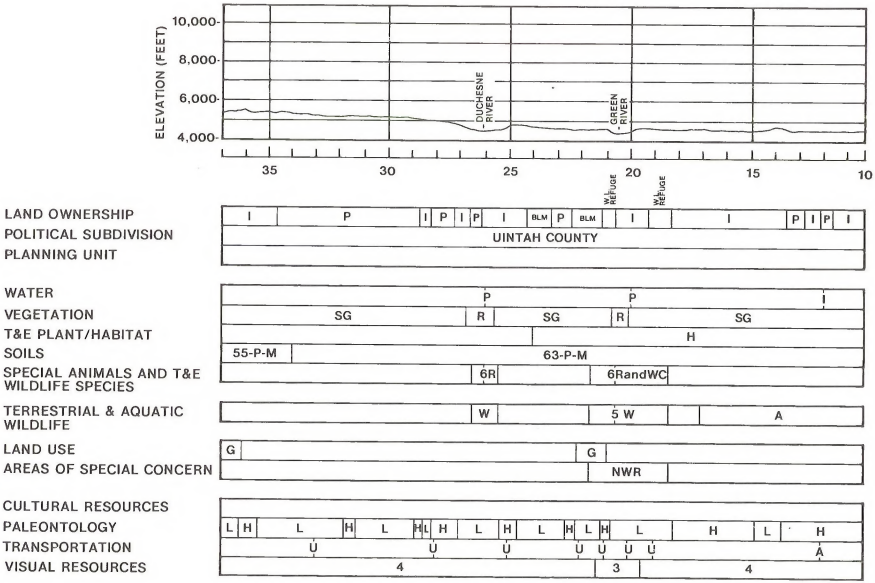


FIGURE 5

PROFILE AND DATA SHEET
MILEPOSTS 10 TO 35

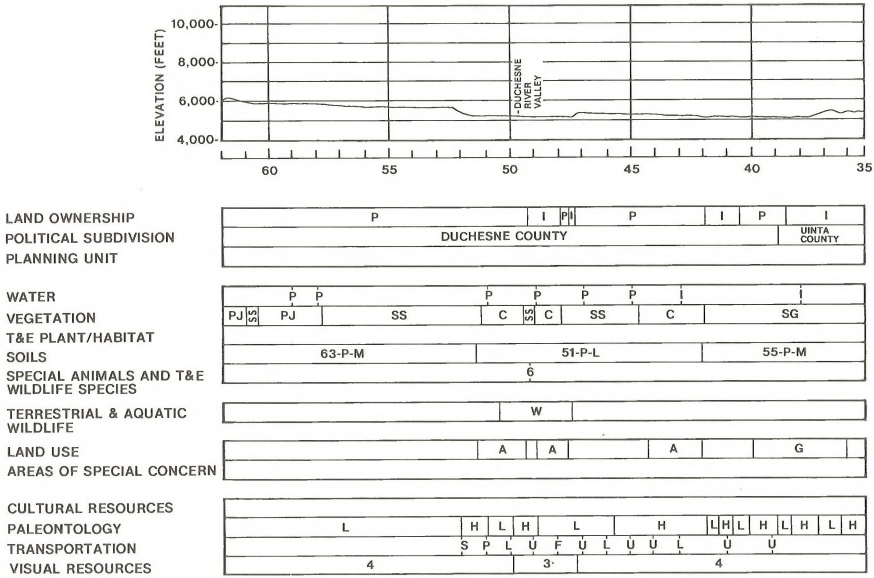


FIGURE 6

PROFILE AND DATA SHEET
MILEPOSTS 35 TO 60

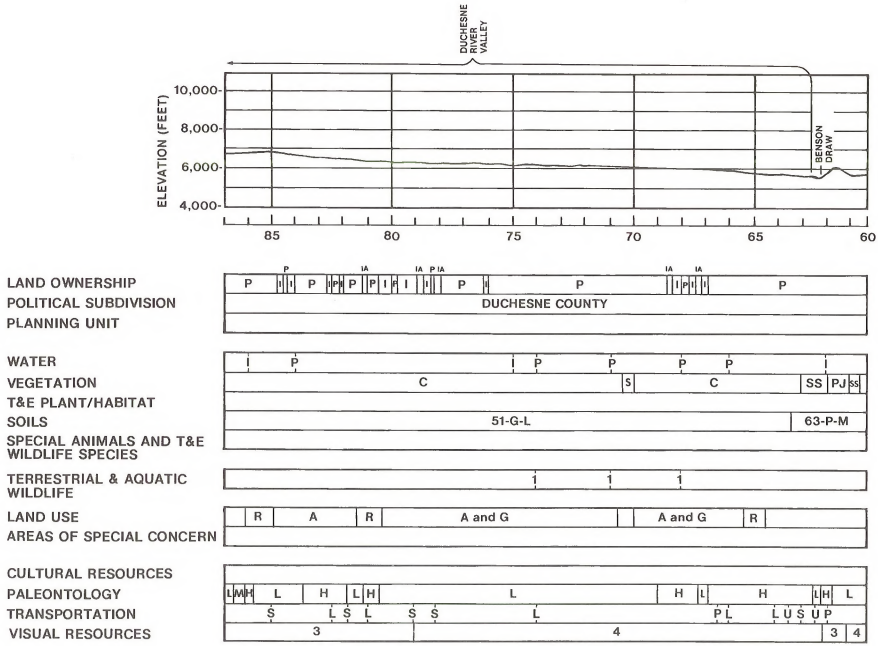
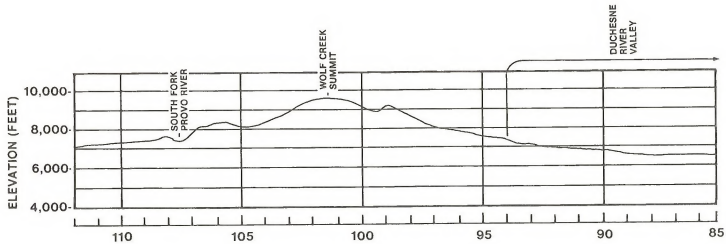


FIGURE 7

PROFILE AND DATA SHEET
MILEPOSTS 60 TO 85



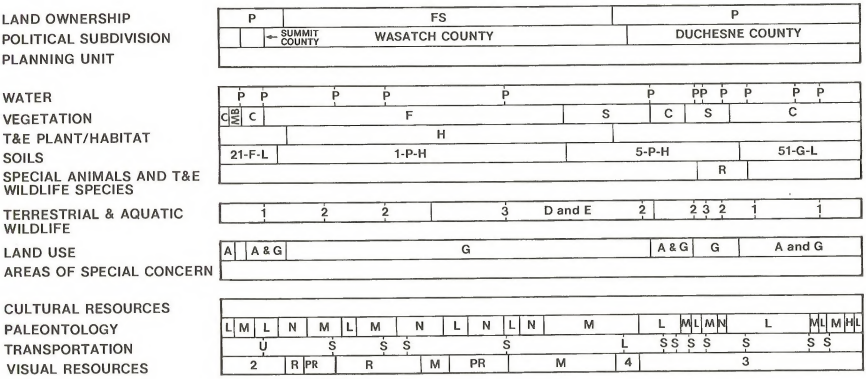


FIGURE 8

PROFILE AND DATA SHEET MILEPOSTS 85 TO 110

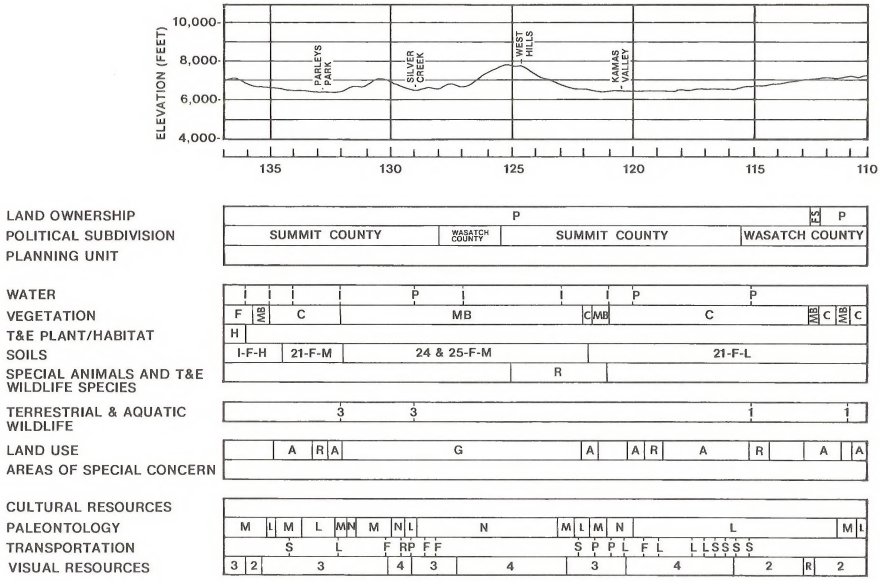


FIGURE 9

PROFILE AND DATA SHEET
MILEPOSTS 110 TO 135

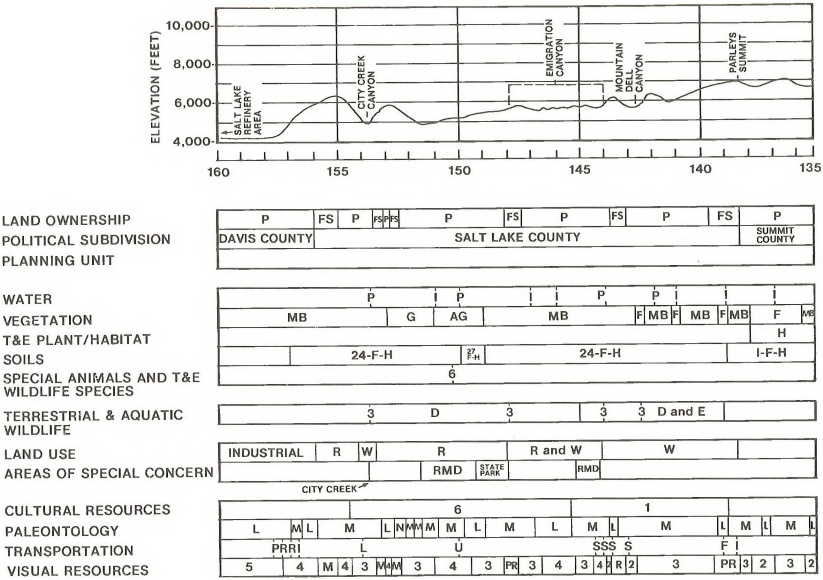


FIGURE 10

PROFILE AND DATA SHEET
MILEPOSTS 135 TO 160

2.1 SOCIOECONOMICS

The alternative would traverse counties which are generally rural (except for Salt Lake County at the western end of the alternative pipeline corridor). Populations are listed in Table 2.

These counties and the Uintah and Ouray Indian Reservation are experiencing development and growth from energy, water, and/or community expansion projects. For example, Uintah County is affected by the construction of the Bonanza coal-fired powerplant; Duchesne County is affected by construction of the Central Utah Water Project; Summit County is experiencing ski area resort expansion near Park City; and Wasatch and Salt Lake counties are undergoing substantial residential and community growth.

Table 2

1980 Census Data

County	Population	Largest City	Population
Uintah	12,506	Vernal	6,600
Duchesne	12,565	Roosevelt	3,842
Wasatch	8,523	Heber City	4,362
Summit	10,198	Park City	2,823
Salt Lake	619,066	Salt Lake City	163,033

(Source: Bureau of Census, 1981; Ute Indian Tribe, Uintah and Ouray Reservation Population/Census data.)

2.2 AIR QUALITY

The ambient air quality along most of the pipeline corridor is usually good, typical of the sparsely populated non-industrial areas of the intermountain area. However, the area which would be located on the western end of the corridor in the Salt Lake Valley is subject to frequent, noticeable air quality degradation. Salt Lake County is classed as a nonattainment area for particulates and carbon monoxide, primarily as a result of emissions from vehicle traffic during periods of air stagnation resulting from temperature inversions. The east end of the corridor in the Uintah Basin is also subject to frequent inversion periods during the winter causing a visible brown haze. Vehicle exhaust, oil pit burn-off, and pollution carried from outside the Uintah Basin are additional factors in causing noticeable air quality degradation along the eastern end of the corridor during certain periods of the year.

Areas most susceptible to air quality degradation from wind blown dust from disturbed soils are in the vicinity of Leland Bench (MP 25) to Bridgeland (MP 54), and the area from Kamas Valley (MP 121) to Parley's Park (MP 132). Also, strong canyon winds in Emigration Canyon generate occasional dusty conditions when land surface disturbance exists.

2.3 NOISE

The proposed pipeline would pass through generally rural areas of low population density, although some residential, commercial, and industrial development does occur along the proposed route. The ambient noise levels in rural areas along the proposed right-of-way typically range from 35 to 55 decibels with an A-weighted (mid-frequency emphasis) sound level or dB(A). This is based on estimates of typical background noise levels based on population density as shown in Table 3. An exception would be along local busy traffic zones, such as the freeway upgrades near Parley's Summit or the railroads and freeways near the Salt Lake refinery area where higher sound levels frequently exist.

Table 3

Noise Levels

Location	Persons per Square Mile	Averaged and Weighted Day-Night Sound Levels or L_{dn}(dB)
Rural--Undeveloped	20	35
Rural--Partially Developed	60	40
Quiet Suburban	200	45
Normal Suburban	600	50
Urban	2,000	55
Noisy Urban	6,000	60
Very Noisy Urban	20,000	65

(Source: National Research Council 1977)

L_{dn}(dB) = formula for measuring sound energy averaged over a 24-hour period; L_{dn} is a day-night sound level measurement; dB represents the word "decibel" and in acoustical terms, generally relates sound pressure level or sound power level to a selected reference level.

2.4 WATER RESOURCES

The alternative would cross many intermittent and perennial streams. Intermittent and perennial stream crossings were identified from the National Topographic Maps 1:250,000 scale series. All named stream crossings are listed by milepost in a downstream order. In addition to the flow classification, the streams were given a habitat value classification in accordance with the State of Utah Stream Classification System, which is based upon the fishery potential of the stream (Utah State Department of Natural Resources 1970). They also were classified by use of the State of Utah Standards of Water Quality, which establish protection requirements for surface waters (Utah State Department of Health 1978).

Table C-1 (Appendix C) lists the stream crossings by milepost, flow class (intermittent or perennial), habitat value, and State of Utah stream classifications. Mileposts can be located by referring to Map 1 and Figures 4 to 10.

A description of the methods of construction that would be used can be found in Chapter 1 and the UBS EIS.

No attempt was made to determine the various distributions of particle sizes which would be found in each of the streams crossed. A prior study (BLM 1981b) indicated that most streams of the intermountain west can be generally grouped in one of two particulate distribution categories: those streams containing predominantly larger particles (50 percent [D_{50}] of particle sizes larger than 2.6 mm) and those containing predominantly smaller particles (D_{50} of 0.25 mm). The intermountain west is characterized by steep, rugged mountain ranges separated by broad, flat basins. The streams which emanate from the steep mountains flow at high velocities and carry all but the largest particles with the flow. With an abrupt change of slope at the entrance to a basin, the smaller particle sizes (except for the very small colloidal material) begin to settle out.

The streams located up to about MP 82 are considered to be shallow-sloped (this is exhibited by many oxbows in the streams up to this point) and are expected to carry predominantly smaller particle sizes. The contour interval of USGS maps along the pipeline route changes near this point from 20 feet to 40 feet. All streams located from MP 82 to the end of the alternative pipeline route are considered to be in steeper terrain and are expected to contain a predominance of larger material sizes in their streambeds.

2.5 VEGETATION, SOILS, AND RECLAMATION

Vegetation

The Salt Lake City Alternative Product Pipeline would cross eight vegetation types. Refer to Table 4 for a list of the affected vegetation types exclusive of crop lands. Refer to Figures 4 to 10 for a milepost location of the types. Each type is a composite of numerous subtypes with widely varying plant composition. The wide variation of types exists due to differences of temperature, elevation, precipitation, and length of growing season along the corridor route. The eastern third of the route would cross desert terraces and benches where temperature ranges are extreme from summer to winter (90° to 0° F) and precipitation is low (less than 8 inches). The center portion of the route would cross plateaus (associated with both desert and mountain climates) where temperature ranges are less extreme (65° to 0° F) and precipitation is greater (18 inches to 30 inches) than the desert area. The western third of the route would cross over mountains and mountain valleys, again exhibiting a narrower temperature range (20° to 85° F) and greater precipitation rates (18 inches to 30 inches).

Table 4

Miles and Acres of Potential Non-Cropland Vegetation Affected

Vegetation Type	Miles[a]	Acres[a & b]
Forest	16	116
Mountain Brush	30	218
Sagebrush	6	44
Pinyon-Juniper	4	29
Saltbush-Greasewood	42	305 +3
Sagebrush-Saltbush	12	87
Annual Grasses	2	15
Perennial Grasses	3	22
	115	836 +3 = 839
Riparian (No. of crossings)[c]	47	84
	Total acres =	923

Source: Forest Service data, SCS Soils Publications, vegetation maps, and personal contacts.

a Does not include croplands, therefore, total miles and acres (115 miles and 923 acres) shown in Table 4 do not equal total acres of potentially affected vegetation, i.e., there would be 160 miles and 1,254 of vegetation affected, 45 miles (331 acres) of which would be on cropland.

b Acreage based upon 60-foot wide right-of-way as described in Chapter 1 (includes 3 acres for pump station at MP 44).

c Riparian vegetation was computed at a width of 250 feet wide by 450 feet long at each stream crossing listed in Appendix C. Acres are inclusive of all vegetation types.

The following is a brief description of each major vegetation type:

Forest

Forest type is a collective term used for a mixture of conifers, deciduous trees, and brush that forms a broad continuous band or irregular spaced patches along the pipeline route. The type occurs at elevations between approximately 7,400 to 8,400 feet. Immediately below the forest type is mountain brush or sagebrush, depending on exposure. Precipitation ranges from 15 to over 20 inches annually. The more common species found in the forest vegetation type are:

Conifers: Engelman spruce (Picea engelmannii) and subalpine fir (Abies lasiocarpa).

Deciduous trees and shrubs: Aspen (Populus tremuloides), common chokecherry (Prunus virginiana), snowberry (Symphoricarpus oreophilus), and serviceberry (Amelanchier alnifolia).

Forbs: Geranium (Geranium richardsonii) and bluebells (Mertensia arizonica).

Grasses: Kentucky bluegrass (Poa pratensis), mountain brome (Bromus marginatus), and sedges (Carex spp).

Mountain Brush

Mountain brush vegetation would be found from elevations of 4,900 to 7,900 feet along the alternative route. Precipitation ranges from 15 to 25 inches annually. Next to the desert brush type, mountain brush is the most widespread of the major vegetation types which would be found along the route. This type is characterized by:

Gambel oak (Quercus gambelii), bitterbrush (Purshia tridentata), big sagebrush (Artemisia tridentata), Rocky Mountain maple (Acer glabrum), chokecherry, snowberry, and serviceberry.

The mountain brush type can be found in pure stands or mixed with grasses, forbs, timber, and/or sagebrush. Forbs found with this type are similar to those found in the forest type. Grasses are needlegrasses (Stipa spp), Great Basin wildrye (Elymus cinereus), mountain brome, bluegrasses (Poa spp), junegrass (Koeleria cristata), and wheatgrasses (Agropyron spp).

Sagebrush

The sagebrush type would be found along portions of the pipeline corridor route that cross high desert, mountain plateaus, and mountain valley bottoms. Elevations range from 6,400 to 8,000 feet, with annual precipitation ranging from 8 to 18 inches.

The sagebrush type generally exists as a dense ground cover.

Species represented in the sagebrush type include big sagebrush, western wheatgrass (Agropyron smithii), muttongrass (Poa fendleriana), buckwheats (Erigonum spp), western yarrow (Achillea lanulosa), and bitterbrush.

Pinyon-Juniper

Next to annual and perennial grass vegetation types, the pinyon-juniper type is the least widespread of the major vegetation types which would be found along the pipeline corridor route. This vegetation type would be found within a 4-mile portion of the route along the Blue Bench area of the Duchesne River Valley. The type occurs as small irregular patches between desert shrub types to the south and east and mountain brush-forest types to the north and west. Precipitation in this area ranges from 8 to 15 inches annually, with elevations ranging between 5,900 and 6,000 feet.

The typical plant species of this type are Utah juniper (Juniperous osteosperma), black sagebrush (Artemesia nova), shadscale (Atriplex confertifolia), galleta grass (Hilaria jamesii), and bitterbrush.

Saltbush-Greasewood

The saltbush-greasewood vegetation type is the most widespread of the major vegetation types which would be found along the pipeline corridor route. This type is found in the desert terrace and bench areas of the Uintah Basin (from the Plant Site to the Myton community area). Elevations range from 4,700 to 5,300 feet, with annual precipitation generally below 8 inches.

A few of the major species are shadscale, greasewood (Sarcobatus vermiculatus), spiny hopsage (Grayia spinosa), spiny horsebrush (Tetradymia spinosa), and little rabbitbrush (Chrysothamnus viscidiflorus).

Forbs are represented by Russian thistle (Salsola kali) and halogeton (Halogeton glomeratus). Grasses are galleta grass and squirrel tail (Sitanion hystrix).

Sagebrush-Saltbush

The sagebrush-saltbrush vegetation type is located in the Duchesne River Valley area and adjacent bench areas from the community of Myton to Benson Draw. Annual precipitation ranges upward from 5 inches to 15 inches at elevations ranging from 5,200 to 6,000 feet.

The species composition difference between this vegetation type and that of the saltbush-greasewood type is the presence of black sage and the transition from less greasewood to more shadscale.

Annual Grasses

The annual grass vegetation type is located on the lake terraces or foothills forming the east boundary of Salt Lake City municipal developments. The route through this area would be located at an elevation of 5,000 to 5,200 feet, with an annual precipitation of 14 to 18 inches.

Due to recent past and on-going municipal activities, annual grasses dominate the foothills area. The percent of grass ground cover at any one time during a year depends on the period of precipitation and the amount and duration of human activity along the foothills.

Perennial Grasses

This vegetation type is found in areas somewhat higher than the annual grasses along the Salt Lake City foothills portion of the pipeline corridor route. Elevations range from 5,000 to 6,200 feet, with 14 to 18 inches of annual precipitation.

Perennial grasses include wheatgrasses, bluegrasses, and needlegrasses as the major plant species. Forbs include balsamroot (Balsamorhiza sagittata), Indian paintbrush (Castilleya miniata), and phlox (Phlox longifolia). Big sagebrush is also present.

Riparian Vegetation

Riparian vegetation occurs along perennial and intermittent stream and river courses and along some washes. This vegetation provides important watering, feeding, and breeding areas for many species of birds, reptiles, and mammals. Due to the scarcity of such areas in the Uintah Basin, the riparian vegetation provides key wildlife habitat. From the Duchesne River Valley north and west along the pipeline route, riparian areas are more frequent and more extensive than they are near the Salt Wash plant site.

Species composition in the riparian areas from the plant site to the Duchesne River consists primarily of: Fremont cottonwood (Populas fremontii) and tamarix (Tamarix ramosissima), mixed grasses, greasewood, and rubber rabbitbrush (Chrysothamnus nauseous).

In the Duchesne River Valley west to Hanna, Utah, riparian species include Fremont cottonwood, narrowleaf cottonwood (Populus angustifolia), and brush species of greasewood, rubber rabbitbrush, and squawbush (Rhus trilobata).

Riparian species of the plateaus and mountain zones primarily include: cottonwood trees, river alder (Alnus sp), river willow (Salix amygdaloides), rose (Rosa sp), sedger (Carex spp), and rushes (Juncus spp). Grasses are reedgrass (Calamagrostic stricta) and bluegrass (Poa pratensis). Forbs of willow weed (Epilobium sp), bedstraw (Galium sp), and polemonium (Polemonium occidentale) are also common. Brush species mentioned previously and big sagebrush are also present.

Timber Resources

Timber resources include both commercial saw timber and miscellaneous wood products such as fuelwood and Christmas trees. Commercial saw timber and miscellaneous forest product areas that would be affected along the pipeline corridor route are located on the Uinta National Forest in the southern extension of the Uinta Mountains.

Conifer and aspen trees occupy other areas which would be found along the pipeline route (Wasatch National Forest), but due to low production potentials of the sites and existing land use constraints, no commercial operations or miscellaneous forest product sales are permitted in these areas. The pinyon-juniper vegetation type located on Blue Bench (private and Indian lands) is not managed for, nor does it provide a source of, fuelwood and posts; the trees are scattered and of poor quality. The pipeline route would cross 11.5 miles of commercial timber and/or miscellaneous forest product areas.

The Ute Indian Tribe also has a manageable timber resource that may be affected by pipeline construction activity. Any wood collection from Ute Indian property during or after construction would require permitting by the Ute Tribe and the Uintah Ouray agency, Bureau of Indian Affairs, Forestry Division.

Threatened and Endangered Plant Species

The alternative would traverse several rare, endangered, and threatened species growing in unique or severe habitats. Protection of these species would allow for investigations to proceed on the values that the species might have to future generations.

The following list of potentially affected threatened, endangered, or candidate plants which could be found along the pipeline corridor route was provided by the Fish and Wildlife Service under Section 7 consultation procedures. Additionally, local studies and environmental statements were reviewed and individuals contacted regarding location or knowledge of threatened or endangered plants along the route.

MP 0 - 26.8 (Pipeline route from plant site to the Duchesne River first crossing point):

- Sclerocactus glaucus--listed as threatened (FWS 1981; Tosco 1982a; and Cuch 1982b).

MP 19.9 - 20.9

- Astragulus equisolensii--recommended by Utah Native Plant Society to be placed on review list (Atwood 1982).

MP 95.4 - 109.0

- Penstemon tidestromii--being reviewed for listing by the Fish and Wildlife Service (Atwood 1982).

MP 135.9 - 137.9

- Lesquerella garrettii and Machaeranthera kingii--being reviewed for listing by the Fish and Wildlife Service (Atwood 1982).

Soils

The pipeline corridor route crosses a wide range of geologic, topographic, climatic, and vegetation features. Changes between areas with similar features along the route are abrupt and highly evident. Soil characteristics and changes are closely associated with such features and, as such, can be grouped to correspond to appropriate physiographic areas.

The grouping of soils along the route corresponds to the general soil associations of Utah (SCS & Utah Agriculture Experiment Station 1975). A list of these soil groups (associations) are as follows:

Soil Association No.*	Soil Association*
1	Soils of high mountains usually moist.
5	Soils of Wasatch Mountains and Plateaus - usually moist part of summer.
21	Soils of Wasatch and Uinta Mountain Valleys - usually dry part of summer.
24 & 25	Soils of Wasatch Mountains and Plateaus - usually dry part of summer.
27	Soils of lake terraces and alluvial fans - usually dry part of summer.
51	Soils of desert flood plains and terraces - usually dry in all parts.
55	Soils of rough, broken, and stony desert land - usually dry in all parts.
63	Soils of desert valleys, benches, terraces, and alluvial fans - usually dry in all parts.

* Soil association numbers and physiographic descriptions are from -

U.S. Department of Agriculture, Soil Conservation Service, March 1975. Soils of Utah. Prepared in cooperation with the Agricultural Experiment Station of Utah State University, Logan, Utah.

Soil characteristics, by mileposts, are presented in table 5.

Table 5

Soil Associations Along the Salt Lake City Product Pipeline Alternative[a]

Description of General Soil Association Groups	Milepost Location Miles Acres[b]	Comments - Limitations to Pipeline Construction and Right-of-Way Restoration and Revegetation
Soil Group 1		
Shallow to moderately deep. Moderately steep to very steep slopes - 25-75% on Uinta Mountains; 10-50% on Wasatch Mountains. 18 to 30 inches precipitation.	M.P.s 97.4- 109.4 Miles = 12.0 Acres = 87.0 Acres (Riparian) = 5.0	Areas of high mass movement potential and existing soil creep and slumping. High erosion hazard and rehabilitation of disturbed areas difficult.
	M.P.s 110.9-111.4 M.P.s 134.4-138.9 Miles = 5.0 Acres = 36.0 Acres (Riparian) = 6.0	Erosion hazard low with good rehabilitation potential.
Soil Group 5		
Shallow to moderately deep. Gentle to moderately steep slopes - 5-40%. 14 to 22 inches precipitation.	M.P.s 90.4-93.9 Miles = 3.5 Acres = 25.0 Acres (Riparian) = 5.0	Gently sloping land. Moderate erosion hazard and good rehabilitation potential.
	M.P.s 93.9-97.4 Miles = 3.5 Acres = 21.0 Acres (Riparian) = 1.0	Areas of high mass movement potential, soil slip and slide hazard. High erosion hazard and rehabilitation of disturbed areas difficult.
Soil Group 21		
Shallow to deep. Flat to gently sloping land. 18 to 25 inches precipitation. Most soils in this group are located on land under cultivation.	M.P.s 109.4-110.9 M.P.s 131.9-134.4 Miles = 4.0 Acres = 29.0 Acres (Riparian) = 2.0	Deep soils with low erosion hazard and good rehabilitation potential.
	M.P.s 111.4-121.9 Miles = 10.5 Acres = 76.0 Acres (Riparian) = 4.0	Shallow soils with more than 30% coarse fragments in soil profile. Erosion hazard low moderate and rehabilitation potential fair to good.

Table 5 (Cont'd)

Description of General Soil Association Groups	Milepost Location Miles Acres[b]	Comments - Limitations to Pipeline Construction and Right-of-Way Restoration and Revegetation
Soil Groups 24 & 25		
Very shallow to moderately deep. Gentle to very steep slopes (steep slopes usually associated with canyon areas). 18 - 25 inches precipitation.	M.P.s 121.9-131.9 Miles = 10.0 Acres = 76.0 Acres (Riparian) = 5.0	Some areas of very shallow, stony soils on rolling hills. Moderate erosion hazard and fair rehabilitation potential
	M.P.s 138.9-148.9 M.P.s 149.9-160.0 Miles = 20.1 Acres = 146.0 Acres (Riparian) = 16.0	Mostly on steep to very steep slopes. High to very high erosion hazard and a fair rehabilitation potential.
Soil Group 27		
Shallow. Transition between gently rolling to moderately steep slopes. 15 - 20 inches precipitation.	M.P.s 148.9-149.9 Miles = 1.0 Acres = 7.0	Shallow stony soils. High erosion hazard and fair rehabilitation potential. Area presently highly disturbed from municipal uses.
Soil Group 51		
Deep sandy soils. Flat to gently rolling terrain. 5 - 10 inches of precipitation. Most soils in this group are located on land under cultivation.	M.P.s 42.0-51.4 M.P.s 63.4-90.4 Miles = 36.5 Acres = 265.0 Acres (Riparian) = 25.0 Acres (2 Pump Stations) = 6.0	Low erosion hazard and a good rehabilitation potential.
Soil Group 55		
Shallow. Gentle to steep mesa escarpments and rough broken land. Very sparce vegetative cover. 7 - 8 inches precipitation. Strongly alkaline and saline. Poorly drained.	M.P.s 33.9-42.0 Miles = 8.0 Acres = 58.0 Acres (Riparian) = 2.0	High wind erosion hazard. Restoration very difficult.

Table 5 (Cont'd)

Description of General Soil Association Groups	Milepost Location Miles / Acres	Comments - Limitations to Pipeline Construction and Right-of-Way Restoration and Revegetation
Soil Group 63		
Shallow to deep. Slopes mostly gentle, 0-4% (15-40% on side slopes). 7 - 8 inches precipitation. Strongly alkaline and saline. Well drained.	M.P.s 0-9.8 M.P.s 9.8-33.9 M.P.s 51.4-63.4 Miles = 45.9 Acres = 334.0 Acres (Riparian) = 13.0	Moderate erosion hazard. Restoration very difficult.
	Total Acres = 1,254	(includes 84 acres of riparian and 6 acres at 2 pump stations)

[a] Table information derived from FS data and SCS and FS Soils Publications. Soil series information was extracted from SCS and FS Soils Publications and correlated with the appropriate soil associations. (USDA 1959; USDA 1977; USDA 1974-General Reference Section and Muir 1976-References Cites Section.)

Soils along Western Portion of pipeline addressed by: SCS publications for Parley's Park Portion of Summit Valley, Summit County, Utah; Salt Lake Area, Utah; and a FS publication for the Wolf Creek-West Fork Duchesne River area, Utah.

Soils along Eastern Portion of pipeline addressed by: SCS publication for Roosevelt-Duchesne Area, Utah.

[b] Acreage based upon 60 foot wide right-of-way as described in Introduction and Project Description. Miles and acres are to the nearest half.

2.6 WILDLIFE

Habitat

The distribution and populations of wildlife are limited by vegetation species and plant community structure. Generally speaking, the more diversity of structure and available plant species, the richer the wildlife fauna inhabiting a site. The vegetation communities and principal component plant species occupying the mile-wide corridor along the alternative pipeline route between the Uintah Basin and its Salt Lake terminus is presented in the section on vegetation.

Major wildlife forms and their relationship to various habitat types which would be found along the alternative pipeline corridor are shown in Table 6.

Table 6

MAJOR WILDLIFE FORMS AND THEIR RELATIONSHIP TO HABITAT TYPES

Wildlife	Major Species	Habitat
Fish	cutthroat, brown, brook, and rainbow trout	streams, lakes, beaver ponds, and reservoirs
Mammals-Big Game	mule deer, elk, cougar	conifer forest, aspen, mountain brush, rugged mountains
Small Game	cottontail rabbit	thickets, sagebrush, rocks, cliffs
Non-Game	snowshoe rabbit, coyote, bobcat	thickets, conifer forest, woodlands, rimrock, mountain brush
Birds- Upland Game Birds	chukar, blue and ruffed grouse, Hungarian partridge	arid canyons, conifer deciduous woodland, sagebrush
Non-Game Birds	songbirds, raptors- (Golden Eagle, falcons, accipiters, buteos)	canyon bottoms, conifer & deciduous forest, mountain brush-rugged mountain cliffs
Waterfowl	various ducks, geese, swans	streams, lakes, marshes, and riparian areas.
Reptiles	Great Basin rattlesnake	grassland, brushland, rock outcrops, talus, rocky stream courses
Amphibians	salamander	ponds, reservoirs, lakes, temporary rain pools, sagebrush, grassland, forest

Terrestrial Wildlife

Small Mammals

Approximately 74 species of medium- and small-sized mammals are expected to occur along the alternative pipeline corridor (Griep 1982). Some of the more common small mammals include: various species of mice, shrews, bats, rabbits, hares, chipmunks, ground squirrels, prairie dogs, gophers, rats, moles, weasels, skunks, coyotes, and bobcats. Two major life forms are represented by these small mammals: (1) small herbivores (rabbits, hares, ground squirrels, etc.) and (2) carnivores (coyote, skunk, bobcat, badger, etc.).

Rabbits and hares are found throughout the area which would be traversed by the alternative. Population levels are cyclic and numbers vary annually. Major habitat considerations along the route are food and cover, specifically grasses and forbs.

The many species of small rodents found in all areas which would be traversed by the corridor are also cyclic and their population levels vary annually. Habitat includes grasses and forbs. Surface water is not necessarily a habitat requirement.

The whitetail prairie dog is of particular significance because it may serve as the primary prey species and create burrows which also provide potential habitat for the endangered black-footed ferret.

The black-tailed jackrabbit is very common in the Uintah Basin.

The best information on density presently available indicates that there are about 5 to 20 small mammal species per acre distributed over the vegetative types found in the area. This represents about 10 to 100 individuals or an estimated density of from 50 to 200 small mammals per acre (BLM 1982).

A listing of the mammals occurring or suspected of frequenting the area can be found in Appendix D of this report.

Game Animals

Much of the alternative route is considered to be year-long mule deer range, but numbers are not high at any time. Some concentrations of these animals are found in the riparian vegetation zone along river and stream bottoms and at higher elevations during summer and fall months. Some critical winter areas for mule deer have been identified along the project area. Important habitats such as elk calving or deer fawning areas may exist along westerly sections of the alternative corridor and are delineated on Figures 4 through 10.

A few pronghorn antelope occur along the eastern end of the route but are generally considered uncommon west of MP 9.8.

Populations of Rocky Mountain elk are increasing in the higher elevations along the western half of the alternative route.

Known important habitat areas for various wildlife forms are indicated by milepost on Figures 4 through 10.

Mule deer, pronghorn antelope, and Rocky Mountain elk are the major large game mammals that would occur along or near the pipeline corridor. A few moose may be resident or occasional migrants in higher elevation valley areas along stream courses, meadows, or marshy bog situations west of MP 95.

Mule Deer

The mule deer is the most important big game animal to be encountered west of the 100th Meridian, in an area encompassing nearly half of the continental United States. Mule deer are widespread throughout the area which would be traversed by the alternative.

During the spring months, grasses make up a high percentage of the mule deer diet (up to 20 percent). During the summer months, grass use drops to about 5 percent, while forb use reaches its peak of about 50 percent. New growth on shrub species may account for as much as a third of the diet during this same period (Hill 1956). During the fall, mule deer begin the transition to shrubby vegetation, but forbs may still make up 25 percent of the diet. In contrast with the three comparatively snow-free seasons, winter imposes marked nutritional restrictions. During this time, shrubs and trees furnish much of the diet, up to 75 percent or more (Hill 1956). Mountain mahogany, bitterbrush, oak, and other shrubby species furnish much of this type of forage.

The mule deer population in Utah is currently judged to be increasing and based upon total annual harvest, the mule deer is the most hunted big game animal in the State of Utah (Nish 1980). Populations of the mule deer are larger in Utah compared to most of the neighboring states and they furnish considerable hunting and viewing opportunities.

The most limiting habitat for this animal is their winter range. Location of these crucial areas in relation to the corridor is discussed in Section 2A of Chapter 4 and presented graphically in the Resource Profile Sheets (Figures 4 through 10).

American Elk

Elk are commonly found in forested areas at higher elevations along the western half of the corridor. The elk is an herbivore and its year-round food sources can be categorized into three primary types of plants; browse, grass, and forbs.

Plant growth in late April or early May causes the elk to turn away from coarse, browse forage of the winter range and to avidly seek out new grasses. In one study (Boyd 1970), 83.2 percent of the May diet was grass. Rumen analyses for June and July indicated 91.7 percent of the diet was grass and grass-like plants, while snowberry, currant, and low huckleberry made up most of the 8.3 percent browse in the stomachs. No forbs were found (Boyd 1970). A high percentage of the fall diet was also grass, averaging 92 percent in a

Colorado study. Browse of all types represented an average of 56.9 percent of the plants consumed during the period from December through April in Colorado (Boyd 1970). On a frequency basis, grass and grass-like plants (mostly sedges) represented 65.6 percent of the plants consumed during an annual period. Woody species averaged 26.8 percent and forbs, 7.6 percent, of diet compositions reported (Kufeld et. al. 1973).

Pronghorn

Pronghorns typically occupy areas of low, rolling, wide-open terrain. Areas that produce and maintain high pronghorn populations usually have water available every 1 to 5 miles (Sundstrom 1968). Pronghorns would be found in limited numbers in rolling sagebrush areas in widely scattered locations along the eastern terminus of the corridor but are considered to have marginal importance west of MP 12.

Food habit investigations have established that pronghorns depend upon sagebrush and other woody browse, particularly in northern areas where ground cover averaged 50 percent living vegetation (Sundstrom, et. al. 1973). The general vegetative composition on preferred ranges was 40 to 60 percent grass, 10 to 30 percent forbs, and 5 to 20 percent browse (Yoakum 1978).

Moose

The Shiras moose is not uncommon along the western mountainous portion of the pipeline corridor (Schladweiler 1974). Moose prefer isolation and most commonly inhabit riparian, marshy, and wet meadow areas. They are primarily browsers and feed on stems and leaves from a large variety of trees and shrubs. Winter browsing consists primarily of accessible stems of trees and shrubs (Geist 1963). During the summer, browsing consists of mostly leaves, although some stems will be taken. Grass and forbs are taken by grazing. Total browse intake averages about 9 percent through fall, winter, and spring (late September through mid-June), and drops to about 66 percent in summer (Schladweiler 1974). Forbs make up 12 percent or less of the fall/winter/spring diet and about 33 percent of summer forage. Grass and grass-like plants rarely make up more than 1 percent of the diet during any season.

Furbearers

Few furbearers would be found in significant numbers along the alternative route other than beaver, but beaver occur along most perennial streams. There is little trapping of any significance in the area along the alternative pipeline corridor although other species of furbearers such as mink, pine marten, and bobcat are either known or suspected to inhabit the area. Little or no information is available on these species in the study area.

Wild and Free Roaming Horses

Wild horses do not normally occur year-round in the study area, but may occasionally range into the area which would be east and south of the alternative route.

Birds

The diversity of vegetative types found within the study area provides habitat necessary for a wide variety of birds including numerous species of upland game birds, raptors, waterfowl, and passerines (Robbins, et. al. 1966). Some of the upland game birds which could be expected to occur along or near the route include sage grouse, ruffed grouse, blue grouse, ring-necked pheasant, chukar, gray partridge, and sharp-tailed grouse.

Sage Grouse - The sage grouse is a major upland game bird found in Utah in the vicinity of the corridor. Except for heavily timbered areas, they may be found throughout most of the corridor length in association with sagebrush vegetation. Three crucial habitats necessary for continued survival of this species are strutting grounds (or leks), nesting and brooding habitat, and winter concentration areas.

The courtship ritual ("booming" or strutting) takes place during April and May, with peak numbers of male grouse appearing by the first week of April; females usually arrive between the first and third weeks of April, and rarely stay longer than 5 days on the grounds (Patterson 1952; Gill 1966; Carr 1968). Since sage grouse nest within 2 miles of a lek (Braun et. al 1977), all of the nesting habitat associated with strutting grounds should be classified as crucial habitat (Patterson 1952). These grouse occur throughout sagebrush areas in the spring and early summer, but concentrate near water sources in late summer and fall.

Blue Grouse

Blue grouse would be found in areas of higher elevation along the western half of the corridor. Over its entire range, the blue grouse is associated with the occurrence of Douglas fir and the true firs. The winter food requirements for the grouse consist of needles from these trees as well as buds, twigs, seeds, and pollen cones (Johnsgard 1975).

Females begin nesting in mid-May with hatching peak from mid to late June (Rogers 1968). By the time chicks are 6 to 7 days old, they rapidly become independent and can fly short distances. After 2 weeks, they are able to fly about 200 feet. At first broods use largely grasses and nonwoody weeds for cover, but as these areas dry up, the birds move into deciduous thickets for the remainder of the brooding period.

Pheasant

The ring-necked pheasant would be found along the pipeline corridor in association with agricultural valleys and related riparian areas. Cropland cover types are primarily valuable for food production, especially in the fall and winter. Grassland cover types are mainly used for nesting, breeding, loafing, and good weather shelter areas. This vegetation type furnishes some food, especially for young birds. The woody or rank vegetative types are valuable mostly for protective cover and for providing travel lanes, enabling the birds to move about without exposure.

Chukar Partridge

The present range of introduced populations in North America includes the State of Utah (Johnsgard 1975). Populations of these birds would be found along and near the alternative route. Throughout nearly all of this bird's occupied range, the typical vegetation encountered is a sagebrush grass community, although there are good populations in the southern portions of their range in saltbush-grassland areas (Johnsgard 1975). In addition, this bird prefers rocky slopes.

Water is a limiting factor in summer months and summer rains or a source of succulent plants during the breeding season are very important. Supplemental water furnished by guzzlers has extended the range of this bird in some areas.

Pairing begins in late winter with nesting beginning about mid- to late April. The peak hatching is about the first week of June.

Gray Partridge

The gray partridge (commonly known as the Hungarian partridge to hunters) was introduced into North America and is now widely established in southern Canada and the northern United States. Populations of these birds are found in portions of Utah (Johnsgard 1975).

This species appears to favor a combination of cropland and native grasses, while woody and brushy cover types are evidently of little significance for the birds' survival. Native grasslands, or even hayfields, are used for nesting cover and brood protection. These birds utilize all of the major small grain crops found in the northern plains, especially corn, wheat, barley, and oats.

Nest construction usually begins about late April, with egg laying being completed about mid-May and incubation completed near mid-June (Johnsgard 1975). Peak of hatching is usually from about June 15 to July 7 (Porter 1955).

Raptors

Because of the recognition of the many values of raptors, they are now totally protected by Federal law and by most states. The Endangered Species Act of 1973 and the Federal Land Policy and Management Act of 1976 make it essential that important habitats are identified and protected.

Various species of raptorial birds occur throughout the area which would be traversed by the alternative. These species include the Cooper's hawk, goshawk, sharp-shinned hawk, red-tailed hawk, Swainson's hawk, rough-legged hawk, ferruginous hawk, marsh hawk, American kestrel, and prairie falcon (Griep 1982). The golden eagle is discussed in a separate section below. The bald eagle and peregrine falcon are discussed in the Threatened and Endangered Species section of this report.

The above listing includes only the more obvious raptorial birds found in the area and should not be construed as a complete list.

Abundant raptor habitat in the form of cliffs for nesting and large, open basins near the cliffs for hunting, would be found throughout the project area. Prey for these species consists primarily of small mammals ranging in size from mice to rabbits with birds and insects also furnishing food (BLM 1974; Williams and Matteson 1973).

Golden Eagle

In the United States, the greatest concentrations of golden eagles are found in the western states, particularly in mountain habitat and intermountain valleys (Snow 1973). They would be found along most of the alternative pipeline route.

Although the golden eagle shows a wide diversity in its food habits, it shows a strong preference for small mammals, particularly rabbits and rodents. These species may comprise from 70 to 98 percent by weight, of an eagle's diet (Brown and Amadon 1968). Golden eagles have a number of alternate nests, ranging from 1 to 14 (two to three alternate sites are common) (Kochert 1973; Murie 1944). Human disturbance appears to be a major factor in nesting failures. Boeker and Ray (1971) noted that human disturbances were responsible for 85 percent of all the nesting failures observed in their study of golden eagles along the front range of the Rocky Mountains. Where human pressures are great, golden eagles have completely abandoned their nesting territories and, in some cases, have moved to higher altitudes to nest (Murphy, J. 1973). Twenty-one percent of the nesting failures documented in southwestern Idaho were caused by human disturbance between 1970 and 1971 (Kochert 1972).

Other Birds

There are over 200 species of birds that could occur along the alternative pipeline corridor (Griep 1982). A list of common species along selected sections of the pipeline corridor would include lark sparrows, sage sparrows, horned larks, burrowing owls, and rock wrens. At the present time, best density estimates of small birds indicate that there are about 8 to 40 breeding pairs of small birds per 100 acres when averaged over the vegetative types found in the area (BLM 1982). The shallow, sage-covered draws in this area furnish nesting habitat for marsh hawks, while the riparian zone along the major streams furnishes many tree nesting sites for other species of raptors. The entire area, however, is hunting habitat for all species of raptorial birds.

A listing of bird species which could be expected to occur in the area can be found in Appendix D of this report.

Waterfowl

Waterfowl would be the most abundant migrants in wetlands and along stream courses in the pipeline corridor. Some waterfowl feeding activity would occur

in agricultural fields. Other than at stream crossing sites, the most significant area in terms of waterfowl activity would be adjacent to the approximately 3 miles of alternative pipeline across Ouray National Wildlife Refuge land between MP 18 and 21. The most important stream crossings in terms of waterfowl areas would be at the Green River crossing through the Ouray Refuge (MP 20), the Duchesne River crossing at MP 26, and the Duchesne River crossing between MP 48 and 49 (Cranney 1982).

Reptiles and Amphibians

Reptile and amphibian numbers appear to be low along the area which would be traversed by the alternataive. There are at least 7 species of amphibians and 14 species of reptiles that could be found along the corridor (Stebbins 1954). Amphibian species would be found in the vicinity of wetlands and stream crossings in conjunction with riparian habitats.

The best density estimates for reptiles in this area indicate that there are about 4 to 5 species per acre with 2 to 3 individuals per species per acre, or an estimated density of 8 to 15 reptiles per acre (BLM 1982).

Aquatic Wildlife

A listing of stream and river crossing/construction locations is presented in Table 7. Tables are also presented in Appendix D which list all fish species likely to be encountered in the streams which would be crossed by the alternative.

There are a number of unique warm water fish species native to the Colorado River system that are on the verge of extinction (F&WS 1979) and some of these are now listed as Threatened and/or Endangered, either on a state or federal list. These species are treated in the Threatened and Endangered Species section.

For the purposes of this report, aquatic communities are characterized in terms of their important fish species. A species is noted as "important" if (1) it is a highly sought after sport species, or (2) it represents remnants of a once common native population.

The two major aquatic habitat types that could be found along the alternative route are warm water and cold water. Warm water habitat is predominantly found in the lower reaches of larger rivers. The Green River is an example of this habitat type. Typical species found in the Uintah County segment of this river are mostly in the Cyprinidae (minnow) and Catostomidae (sucker) families. However, many cold water Salmonid species may be found in the stretch of river below Flaming Gorge Reservoir.

The cold water habitat varies from smaller mountain tributaries to major drainages along the alternative route. Fish populations in these streams are usually dominated by Salmonid species, although Catostomidae and Cyprimidae families also are often found in these same streams. Rainbow, brown, brook, and cutthroat trout, and mountain whitefish are the most common cold water species in these streams (Mills 1980).

The major streams which would be crossed by the alternative corridor are the White River, Green River, Duchesne River, Rock Creek, West Fork Duchesne River, and the Provo River. These rivers receive runoff and recharge from several other smaller streams with headwaters in adjacent areas, mostly the Uinta mountains. Of these, the principal streams are Wolf Creek, Mountain Dell Creek, South Fork of the Provo River, Emigration Creek, and City Creek. Table 7 lists all major rivers and perennial streams which would be crossed by the pipeline and their respective locations.

Table 7

Major Rivers and Streams

River/Stream Name	Habitat Value Class[a]	Nearest Milepost Location
White River	VH (T&E)	6.7
Green River	VH (T&E)	19
Duchesne River	VH (T&E)	26
Duchesne River	VH (T&E)	49
Rock Creek	VH	68
Duchesne River	VH	71
Duchesne River	VH	74
Duchesne River	VH	87
Duchesne River	VH	90
West Fork, Duchesne River (3)[b/]	VH	91
Spring Creek	H	92
West Fork, Duchesne River (2)[b/]	VH	92
Wolf Creek	VH	94
Wolf Creek	H	100
South Fork, Provo River	H	105
South Fork, Provo River	H	107
Provo River	VH	110
Provo River	VH	111
Provo River	VH	115
Silver Creek	H	129
Kimball Creek	M	132
Mountain Dell Creek	H	142
Emigration Creek	H	147
Red Butte Creek	H	150
City Creek	H	154

a/ VH = Very High
H = High
M = Moderate
(T&E) Threatened & Endangered

b/ Multiple Crossings.

Source: U.S. Geological Survey 7.5 Minute Quadrangles and Utah State Department of Natural Resources 1970.

Threatened and Endangered Species

No threatened or endangered terrestrial wildlife species have been identified within the corridor, although areas of potential occurrence are present. The pipeline corridor would intersect the Ouray National Wildlife Refuge for approximately 3 miles of its route. This refuge hosts a high number of migratory birds, and is occasionally used by the endangered whooping crane. Bald eagles make extensive use of the refuge during the winter. They may also use riparian areas as winter habitat where the alternative would cross major rivers (Cranney 1982). The Green River and White River are currently under study to determine what role they may play in the life cycle of the Colorado River squawfish, humpback chub, and bonytail chub.

On September 23, 1981, the U.S. Fish and Wildlife Service was sent a letter requesting a list of federally listed plant and animal species that might occur in the potential impact area of this and other projects (see Appendix D for correspondence and related materials). Several animal and plant species were identified as potentially occurring along the alternative pipeline route and are discussed below.

State level legislation affording protection to endangered species has been approved in California. The states of Idaho, Nevada, Utah, and Wyoming protect most non-game wildlife under other statutes or regulations. Some of these species are of special concern because their restricted range, specific habitat requirements, and/or low population numbers make them vulnerable to elimination from the state if adverse impacts to population or habitat occur.

Mammals

No known federally listed or proposed endangered or threatened mammal species would occur in the alternative corridor area. However, active whitetail prairie dog colonies could furnish habitat for the federally listed endangered black-footed ferret as Uintah County, Utah, is within the historical range of the ferret (Gates 1973; Hall and Kelson 1959).

Black-Footed Ferret

The black-footed ferret may be the rarest mammal on the North American continent (Gates 1973). Original range of the black-footed ferret and prairie dogs coincided in pre-settlement times. The black-footed ferret occupied almost all of the mid- and short-grass prairie region from Saskatchewan and Alberta in the north, to areas of New Mexico and Texas in the south (Gates 1973) including Utah. Prairie dog colonies are potential habitat for the black-footed ferret which would occur along the alignment of the pipeline route.

The black-footed ferret was listed as endangered in March 1967 (Federal Register) 1967. The prairie dog is the ferret's main source of food. The effect of ferrets on prairie dog populations depends on the size of the colony and the number of ferrets present (Snow 1972; Martin and Schroeder 1978).

Because very little population data is available, it is difficult to determine whether or not the total ferret population level is declining. The ferret apparently has never been common and has always been difficult to observe. Most ferrets have been observed in association with prairie dogs, and the reduction in prairie dog numbers is probably an indication of the reduction in numbers of ferrets (Snow 1972; Henderson, et. al., 1974).

Birds

Three endangered bird species could occur or migrate over the alternative corridor: the whooping crane, peregrine falcon, and bald eagle.

Bald Eagle - The bald eagle occurs throughout the United States and northward (F&WS 1981d). Utah is included in the winter range of the bald. The bald eagle was listed as endangered throughout the 48 contiguous states in February 1978 (Federal Register) except for the populations in Washington, Oregon, Minnesota, Wisconsin, and Michigan, which are classified as threatened.

The bald eagle has been afforded protection since the passage of the Bald Eagle Act in 1940 (Snow 1973). Along with its Federal status, the bald eagle also is protected by state laws in California, Idaho, Nevada, and Utah.

The bald eagle is associated primarily with riparian habitat, including coasts, rivers, and lakes, usually nesting near bodies of water where they feed. Selection of nesting sites varies depending on the species of trees growing in a particular area. The tops or large branches of tall trees, either living or dead, are generally preferred. Regardless of this variation in sites, there are certain general elements which seem to be consistent: (1) the proximity of water (usually within a half mile with a clear flight path to a close point on the water); (2) the largest living tree in a span; and (3) an open view of the surrounding area. The proximity of good perching trees may also be a factor in site selection. An otherwise suitable site may not be used if there is excessive human activity in the area (F&WS 1981).

Eagles found at roosts during winter and at other times apparently have an attraction to particular trees and even to favorite limbs. These trees are usually large and open and have sufficient room for takeoff and landing, but they are not noticeably different from the other trees in the same general area. A favorite tree may hold several eagles before nearby trees are used (Sprunt 1972; Snow 1973).

The most significant factors contributing to the decline of bald eagles have probably been loss of feeding and nesting sites and human disturbance during the nesting period. Additional factors responsible for the decline include illegal shooting and the loss of nesting trees (F&WS 1981). Wintering bald eagles gather along rivers, lakes, wildlife refuges, and other places where food is available.

Whooping Crane - The whooping crane is presently known to nest only in Woods Buffalo National Park, Canada. The whooping crane winters along the Gulf Coast of Texas on the Aransas National Wildlife Refuge and adjacent peninsulas and islands (F&WS 1981).

A cross-fostering experiment is being conducted at Gray's Lake National Wildlife Refuge in Idaho, in which whooping crane eggs are incubated and hatched by greater sandhill cranes. The sandhill cranes rear and reintroduce the whooper chicks into the wild. A migrating population of whooping cranes which winters in the Bosque Del Apache National Wildlife Refuge in southern New Mexico has been established. During their migration flights, the cranes may cross over and utilize riparian vegetation and wetlands along the alternative pipeline route. Small numbers of reintroduced whooping cranes have summered just north of Bear Lake National Wildlife Refuge and near the Bear River in the vicinity of Thatcher, Idaho (Loth 1981). The whooping crane was listed as endangered throughout its range by the Department of the Interior in March 1967 (Federal Register).

American Peregrine Falcon - The entire alternative corridor area falls into the former breeding distribution area of the American Peregrine falcon (Porter, et. al., 1973).

There are currently no known active eyries along the alternative corridor route. However, at least one active eyrie is currently known in the Dinosaur National Monument and the corridor may be frequented by the same birds (Harper, 1982).

Individual birds have recently been sighted along the corridor area which contains suitable habitat (Cranney 1982). Suitable nesting habitat consists of rugged inaccessible rock formations (Salt Lake County Planning Commission, 1975). One study estimates that the present total population of the peregrine falcon in Utah is possibly only 10 percent of what it had been in historic times, and concludes that pesticide contamination and climatic changes may have been the major reasons for their decline in Utah (Porter, et. al., 1973).

> Most peregrine eyries in the state were found in east and north facing cliffs. Although the escarpment along the Wasatch Mountains provided cliffs which faced all directions, 10 of 12 eyries for which data is available,were at sites facing northward (five eyries) and eastward (five eyries). This suggests a directional orientation by the peregrine to the sun's exposure (Porter, et. al. 1973). In contrast, studies have found that Golden Eagles in Montana (Porter, et. al. 1973) and raptors in general on the Uinta National Forest (Kimbal 1975) tended to avoid northern exposures for nesting sites.

Fishes

The endangered Colorado squawfish, humpback chub, and bonytail chub have been found in the Green River. In addition, one other species of concern, the razorback sucker, would be found along the alternative corridor (F&WS 1979; Harper 1982).

The Colorado squawfish, the largest minnow in North America was once commercially abundant, reached weights of 50 to 80 pounds, and made extensive

spawning migrations. Today it has virtually disappeared from the lower Colorado basin and is rare in the upper basin. The Colorado squawfish is an endangered species protected by Federal and State laws (F&WS 1979).

The humpback chub is found now only sporadically in the canyon areas of the Colorado River basin's large rivers. A small population disappeared from Lodore Canyon on the upper Green River after Flaming Gorge Reservoir began operation. A few still may be found in the Little Colorado River in Grand Canyon near the area where scientists identified the first specimen in 1946. Until then, although native people and early settlers knew of it, the humpback chub had not been described in scientific literature. Scientists fear it may become extinct before its biology is understood. Usually less than 13 inches long, it seldom weighs more than 2 pounds. The humpback chub is an endangered species protected by Federal and State laws (F&WS 1979).

The bonytail chub was once distributed throughout the Colorado River basin. Common in the Green and Yampa Rivers in the 1960's, it is virtually non-existent there today. The bonytail chub has experienced the most abrupt decline of any of the fishes native to the main streams of the Colorado River system. It is still found occasionally in Desolation Canyon on the lower Green River, where scientists have reported it feeding in schools at the water's surface. The fast-disappearing bonytail chub has been proposed for Federal protection as an endangered species (F&WS 1979).

The once abundant razorback or humpback sucker is one of the largest suckers in the United States weighing up to 12 pounds. To spawn, the long-lived razorback requires warm, flowing water. In the upper basin, razorback suckers are found in small numbers through most of the remaining free-flowing stretches of river. The razorback sucker is being considered for Federal protection as a threatened species (F&WS 1979).

The Colorado squawfish and the razorback sucker also occur in the lower Duchesne River, probably restricted to that portion of the river below Highway 40 at Fort Duchesne (Harper 1982).

Special or Unique Species

These are species that fall into a category variously described as unique, rare, and/or status undetermined.

Utah (Bonneville) Cutthroat Trout - This is a subspecies of the cutthroat trout that is considered in the report "Threatened Fishes of Utah" to be endangered, although the Utah Division of Wildlife Resources, the U.S. Department of the Interior, the American Fisheries Society, and the U.S. Forest Service have not given it formal classification (Holden 1974).

Preliminary plans have been made for its introduction into Red Butte Reservoir and its tributaries. This would first involve chemically eradicating the existing fish populations. Approval is awaiting studies of chemicals that could be used since the reservoir outflow is used domestically (Kimbal 1975).

The intermountain area, including Utah, contained only one endemic salmonid--the cutthroat trout. Early investigators believe that this native trout form was represented by two subspecies: the Utah cutthroat (Salmo clarki utah) of the entire Bonneville Basin and the Colorado cutthroat (Salmo clarki pleuriticus) of the Colorado River Basin (Duff and Hickman 1979).

The Utah cutthroat trout is endemic to the Bonneville basin and was historically abundant throughout all suitable habitat of a vast area of Utah, Wyoming, Nevada, and Idaho. The Utah cutthroat suffered a catastrophic decline from massive introductions of non-native trouts and habitat alteration and degradation to a point of virtual extinction as pure populations (Duff and Hickman 1979). Today only 14 populations from primarily small headwater streams and one lake population of pure Utah cutthroat are known to exist.

2.7 AGRICULTURE

Cropland

There are three agriculture areas located along the route. Each area is located on distinct and separate terrain and soil conditions; two of the three areas experience similar climatic conditions; the third area has a considerably different climate. All areas, except certain small intensively cultivated lands, are open to livestock grazing, used mainly in the fall and early winter months.

Refer to Table 8 for a list of the affected cropland areas.

Following is a description of the cropland areas.

TABLE 8

Milepost Locations, Miles, and Acres of Potential Cropland Vegetation Affected

Area	Mileposts	Miles	Acres [a]
Duchesne River Valley	42.0-44.4, 48.0-49.0, 49.4-51.4, 63.4-70.0, 70.4-90.4, and 92.4-94.0	33.0	240.0 +3 [b]
Kamas Valley	109.4-111.0, 111.4-112.4, 113.0-120.4, and 121.4-122.0	10.0	73.0
Parley's Park	132.0-134.4	2.0	15.0
		45.0	328.0 +3 = 331.0

Source: SCS Soil Publications, vegetation maps, and personal contacts.

[a] Acreage based upon 60-foot wide right-of-way as described in Chapter 1. Miles and acres are to the nearest half (includes 3 acres for pump station at MP 88).

[b] 5.8 miles (42.2 acres) of the total cropland figures for the Duchesne River Valley area are Ute Tribal croplands, developed and undeveloped; 1.6 miles (11.6 acres) of the total cropland figures are Indian allotted croplands.

Duchesne River Valley

The majority of the Duchesne River Valley, which would be located north and west of the proposed plant site, exhibits agriculture activities. These activities are most evident (occupying most of the valley bottom) between the communities of Duchesne and Hanna; the pipeline corridor route would be located within the northern two-thirds of this developed area.

Along the agriculture lands which would be crossed by the route, average precipitation ranges mainly from 5 to 14 inches, increasing with elevation. Maximum precipitation occurs in the spring and fall. Average freeze-free period is 110 to 180 days.

Alfalfa hay is the principal crop grown in the Duchesne River Valley, occupying about 75 percent of the cropland. Small grains and corn are grown to a lesser extent. Certain small areas are highly cultivated for potatoes, beans, corn, and other garden crops. Most crops are irrigated by canals; some areas near Hanna are sprinkler-irrigated.

Soils are moderately deep. Drainage is good over most of the area; however, some areas exhibit poor drainage due to past irrigation methods.

Prime and unique farmlands as defined by the Soil Conservation Service are located intermittently throughout the corridor in the Duchesne River Valley. Such lands have been tentatively identified by SCS (1982a) over a total of 24.5 miles (178.6 acres) of the 33 miles from MP 42.0 to 94.0 (see Table 8). In the Duchesne River Valley area, these farmland acres are also considered farmlands of statewide importance (see Appendix E for definitions of these terms).

Kamas Valley

The principal land use in the Kamas Valley area is centered around agriculture. The pipeline corridor route would cross the southern end of the valley, where 90 percent of the land is dedicated to agriculture uses. Alfalfa and meadow hay are the principal crops in the area which would be crossed by the pipeline route. The average precipitation in the area is 18 to 25 inches; most of the precipitation occurring during late fall and winter is snow. Average annual temperatures range from 40° to 45° F. Average freeze-free period is 60 to 100 days.

Most of the farmlands are located on shallow soils underlain by a rocky strata; due to this condition no plowing is done on these farmlands. In the area along the pipeline route, this land is irrigated by ditches that release water to flow by gravity across the surface. Due to the shallow soil and rocky substrata, local farmers within the Kamas Soil Conservation District consider these lands to be marginal quality farmland (BLM and FERC 1981).

The Soil Conservation Service has not yet designated prime and unique farmlands in Kamas Valley (SCS 1982b).

Parley's Park

The Parley's Park area is primarily noted for its summer residential and resort values and winter sport values. Agriculture based activities are scattered throughout the area and, although not the area's main commercial venture, are considered important to local livestock owners who profit from the alfalfa and meadow hay crops and fall and early winter pasture land. The alternative would cross through the center of the main body of agriculture land in the area. Alfalfa and meadow hay are the main crops; there is also limited sod farming. The area is irrigated by canals and sprinklers. The average precipitation in the area is 18 to 25 inches. Mean annual air temperature is 42° to 45° F., and the average frost-free season is 60 to 70 days. Soils are deep and poorly drained. No prime or unique farmlands would be crossed by the pipeline route in the Parley's Park area (SCS 1982b).

Grazing

Location

Approximately 579 acres of rangeland with available forage would be affected by pipeline construction activities. The following list shows affected rangeland by land ownership.

Private (Including Indian Allotted Lands)	389 acres (53.5 miles)
Forest Service	102 acres (14.0 miles)
Indian (Reservation Land)	77 acres (10.5 miles)
BLM	11 acres (1.5 miles)
Total	579 acres (79.6 miles)

Small family owned and operated farms would be located along the pipeline corridor route on Indian allotted lands and private lands. These holdings are mainly found between MP 67.0 and 95.4 (Duchesne River Valley) and 109.4 and 121.9 (Kamas Valley). Cattle, sheep, and horse grazing is common on small farm holdings in these areas.

Larger private ranches consisting of 320 to 1,280 acres are found in the Parley's Park area. The pipeline would cross this area from MP 132.0 to 134.4. Grazing of cattle and horses is common in this area.

Several farm and ranch operators in the northern portion of the Duchesne River Valley, the Kamas Valley, and Parley's Park areas have acquired grazing permits on nearby National Forest lands. These livestock operators depend upon Forest Service permits for economic ranch operations involving livestock management, i.e., the permits provide the required grazing for an economic year-round operation.

Limited grazing of cattle, sheep, and horses occurs within the study area across Uintah and Ouray Indian Reservation land. Such grazing occurs from the proposed plant site north to the existing Chevron Oil pipeline route (MP 0 through 9.8 and from MP 36.0 through 40.0 of the pipeline route) (Cuch 1982a). Livestock owners in these areas also depend on grazing rights obtained from the BLM for use of nearby public lands.

Six national forest sheep and cattle grazing allotments would be crossed by the alternative pipeline located between MP 95.4 and 109.0 on the Uinta National Forest. General season of use for grazing on these allotments is mid-June through September.

The BLM administered lands between MP 21.0 and 22.4 encompass areas of low rainfall and poor soil. Limited grazing of cattle and sheep occurs on these lands.

Rangeland with available forage also exists along private lands from Kamas Valley to Parley's Park (MP 122.0 through 132.0). Very little grazing occurs on this rangeland.

Grazing is limited or prohibited on both private and Forest Service lands from the Parley's Park area to the Salt Lake City refinery area (MP 135.0 through 160.0). Protection of watershed, recreation, and residential values have precluded grazing use in these areas.

Capacity

Grazing capacity is extremely variable. Productivity is correlated with vegetation types which correspond to climatic and geographic zones. Forage production varies from 1 acre per animal unit month (AUM) in meadows and high precipitation areas to 60 acres per AUM in the dry desert areas. Private lands vary from 4 to 5 AUM's per acre on irrigated pastures to 15 acres per AUM on non-irrigated pastures; and 40 to 60 acres per AUM on privately-owned, BLM-managed, and Indian-owned desert lands. The Forest Service administered lands are the more productive range lands with carrying capacities from 1 acre per AUM on meadow and upper elevations to 3 acres per AUM at lower elevations near the forest boundaries.

Economic Values

The economic value of an AUM to the private sector for the year 1981 was $10.17 (Griswold 1981). This dollar amount is the monetary value gained per AUM by the private sector for use of National Forest lands.

Forest Service rates set by law for the 1981 season were approximately $2.31 per AUM. Grazing fees on private lands vary according to ownership and leasing arrangements. According to the Farm Real Estate Market Development Report of 1981, the Utah state average fee was $8.40 per AUM (ERC 1981).

2.8 TRANSPORTATION NETWORKS

The pipeline construction would either bore under or trench across major crossings such as Federal and state highways, interstate highways, railroads, and pipelines (to be determined on a case by case basis). Dirt and gravelled roads and perhaps small, light duty paved roads would likely be trenched across.

The pipeline also would cross many canals and irrigation ditches on private and Ute Indian and Indian allotted lands. As discussed in Chapter 1, Tosco

would apply mitigation measures agreeable to the respective landowners for protection and restoration of such facilities.

Following is a brief inventory of crossings which would be encountered by the proposed pipeline. For a complete listing see Appendix F.

15 light duty paved roads
34 state or Federal highways
2 interstate freeways
17 unpaved roads
3 railroad crossings
2 aboveground pipelines
7 transmission lines

The major crossings would likely be bored under to avoid interruption. These could include the railroads, interstate highways, pipelines, and state and Federal highways. It could be necessary to bore under some of the light duty paved roads if a detour site is not available.

Various transportation facilities that would be affected by the Salt Lake City Alternative Product Pipeline consist of roadways, railroads, pipelines, and electrical power transmission lines. The publication, The Need For A National System of Transportation and Utility Corridors, prepared by the U.S. Department of the Interior (July 1, 1975), was reviewed to identify other facilities that would be crossed by the alternative. This source indicates that coaxial telephone communication lines would be crossed at about MP 57, 127, 137, and 157.

Because the railroad, power transmission line, pipeline, and underground cable crossings are not expected to be disturbed by the pipeline construction (due to design and construction precautions), the major emphasis of this discussion is on the potential for impacts to the highway systems. Impacts to highways, roads, and traffic considerations are described further in Chapter 3, Environmental Consequences.

2.9 RECREATION RESOURCES

Introduction

According to a survey of Uintah Basin residents, the five most frequently engaged in outdoor recreation activities are, in order of preference, fishing, driving for pleasure, camping, big game hunting, and swimming (Institute of Outdoor Recreation and Tourism 1978).

The alternative pipeline would traverse approximately 87 percent non-Federal land and 13 percent Federal lands (Table 1). Generally, the majority of outdoor recreation opportunities occur on Federal lands although opportunities may also exist on some non-federal lands (i.e., Uintah and Ouray Indian Reservation and Emigration Canyon). Basically, outdoor recreation opportunities occurring on Federal lands are referred to as dispersed recreation and defined as impromptu camping and day use activities (Hendee et. al. 1976).

This section describes the water-oriented and land-oriented outdoor recreation opportunities and experiences within the study corridor, as well as identifies other popular or unique recreation areas within the general vicinity.

Water-Oriented Recreation Opportunities

The alternative pipeline study corridor would cross the White River at MP 6.7 and Green River at MP 20.4. The White River was nominated for consideration as a National Wild and Scenic River by the State of Colorado in 1975. Because the U.S. Congress decided not to amend the Wild and Scenic Rivers Act (P.L. 90-542), the nomination became void by ruling of the Secretary of the Interior.

Since the 1975 action concerning the White River, both the White and Green Rivers have been identified and are currently on the Nationwide River Inventory, Phase I list as developed formerly by the Heritage Conservation and Recreation Service (now part of the National Park Service). The points along these rivers which would be crossed by the alternative may possess values that have been identified as being nationally significant and that may be eligible for inclusion into the National System. These rivers are not afforded protection status nor are they now being studied for inclusion into the National Wild and Scenic Rivers System (HCRS 1981). Both the White and Green rivers provide limited river running experiences. While there are no use figures available, estimates indicate 20 to 70 parties per year along the White River (BLM 1980b). Fewer parties are known to float the Green River at the proposed river crossing (Troester 1982). The river running beginning points for Desolation and Grays canyons along the Green River are downstream from the crossing point at Ouray or Sand Wash. Limited fishing for channel catfish is known to occur within both rivers.

The alternative (MP 23 and 24) would pass approximately 2.5 miles south of Pelican Lake which has been called the best bluegill lake in Utah (Burdick 1979). The lake is fished all year, and from 1973 to 1977 averaged 7,700 angler days per year (Burdick 1979).

At MP 37, the alternative would pass approximately 14 miles to the south of the Bottle Hollow Reservoir which is administered by the Ute Indian Tribe. The reservoir provides fishing and boating opportunities during the summer. Ice fishing during the winter months is also popular.

The alternative would cross the Duchesne River and West Fork of the Duchesne River several times. Fishing, particularly at the crossing points and along the study corridor (MP 49 and 70.5 to 91.5), provides recreation opportunities important to the Ute Indians and other residents. Rock Creek (MP 68) also provides important fishing opportunities for the Ute Indians.

Starvation Reservoir provides fishing, boating, and sailing opportunities. With recreation facilities administered by the State of Utah, Department of Parks and Recreation, Starvation Reservoir received 31,138 visitors in 1980 (Utah Division of Parks and Recreation 1980). The alternative would be approximately 3 miles north of the reservoir.

The alternative would cross Wolf Creek at MP 93.6 and 100.5 which is within the administrative boundary of the Uinta National Forest. Both of these crossing points provide fly fishing opportunities.

The Provo River also provides important fly fishing opportunities. The alternative would cross the river at MP 104.5, 107, and 111. This segment is part of the Provo River headwaters and is within the administrative boundary of the Uinta National Forest. The headwaters of the Provo River are also known for outstanding fly fishing opportunities.

At MP 142, the corridor would cross the proposed Little Dell Reservoir site which has been authorized by Congress for construction by the U.S. Army Corps of Engineers. If built, the proposed Little Dell Reservoir would include new boating, sailing, and fishing opportunities within the general area.

For a summary of major water-oriented recreation opportunities, refer to Table 9.

Table 9
MAJOR WATER-ORIENTED RECREATION OPPORTUNITIES

Recreation Site	Location	Status	Recreation Opportunities
White River	MP 6.7	Identified in the Nationwide Rivers Inventory, Phase I study as a potential candidate for National Wild and Scenic River designation.	River running and channel catfish fishing
Green River	MP 20.4	Same as White River	Channel catfish fishing and hunting along the river basin
Pelican Lake	2.5 miles north of MP 23 and 24	Administered by Uintah County	Bluegill fishing and boating
Bottle Hollow Reservoir	14 miles north of MP 37	Administered by the Ute Indian Tribe	Fishing and boating
Duchesne River	MP 49, and 70.5 through 91.4 (West Fork at MP 91.5)	Ute Indian Tribe	Fishing
Rock Creek	MP 68	Ute Indian Tribe	Fishing
Starvation Reservoir	3 miles south of MP 64	State of Utah	Fishing, boating, and sailing
Wolf Creek	MP 93.6 and 100.5	Private and the Uinta National Forest	Fishing
Provo River	MP 104.5, 107, and 111	Uinta National Forest	Fly fishing for rainbow trout
Little Dell Reservoir	MP 142	Proposed by the Bureau of Reclamation	Fishing and boating

Source: Bureau of Land Management, Division of Environmental Impact Statements Services, Denver, Colorado, George Detsis - Environmental Specialist, 1982.

Land-Oriented Recreation Opportunities

The primary land-oriented recreation opportunities within the alternative pipeline study corridor include dispersed recreation opportunities, off-road vehicle (ORV) use, hunting, camping, sightseeing, and hiking. The Devil's Rock House, known for its geological features and sightseeing interest, was nominated for designation as a BLM outstanding natural area in 1975. The designation of the 60-acre parcel of land is currently pending (Smith 1981). The Devil's Rock House is approximately 3 miles east of MP 6.8.

The alternative study corridor would cross the Ouray National Wildlife Refuge between MP 18 and 21. The 11,482-acre refuge is bisected by the Green River and is utilized for waterfowl hunting opportunities (pheasant, ducks, chukar, and geese), mule deer hunting, nature study, birdwatching, and sightseeing. From 1980 to 1981, hunting for mule deer tripled from approximately 200 hunter days to 600 hunter days (Troester 1982).

The Bottle Hollow Resort which is located approximately 14 miles north of the study area at MP 37, provides 90 camping units and trailer hook-up facilities. Operated by the Ute Tribe, it is the largest privately owned camping facility in the Uintah Basin.

The alternative would cross the Dominguez-Escalante Trail along U.S. Highway 40 (MP 48). Public Law 94-527 amended the National Trail System Act of 1968 to authorize a study of the Dominguez-Escalante Trail. The study was to determine if this trail should be designated as a component of the National Trail System. In June 1979, the National Park Service completed its study of the 2,000-mile long trail and recommended that it be added to the National Trail System (HCRS 1979, NPS 1979). This designation is currently pending congressional action.

Between MP 95.4 to 109, the alternative would cross the administrative boundary of the Uinta National Forest. According to the travel plan for the Uinta National Forest there are no designated Forest Service roads or trails within the study corridor; the forest is closed to off-road vehicle (ORV) use (FS 1981). Regardless of this closure policy, the existing Chevron oil pipeline right-of-way receives unauthorized ORV use by those recreationists seeking vehicular access into the National Forest.

The Uinta National Forest Wolf Creek Campground at MP 102 is located within the mile-wide study corridor. Campground facilities include picnic tables, grills, pit toilets, and water. The 100-unit campground is heavily used from July to October. During the fall, the campground is used primarily by deer and elk hunters.

Between MP 144 and 149 the study corridor crosses several administrative boundaries of the Wasatch National Forest. As described previously for the Uinta National Forest, there are no designated FS roads or trails within the study corridor, therefore the alternative study corridor would also be closed to ORV use.

The Emigration Canyon, between MP 142 and 149, is on the National Register of Historic Places and includes the Mormon Pioneer National Historic Trail. Hiking, snowplay and snowmobiling, picnicking, and sightseeing opportunities occur within the canyon. The Mormon Pioneer National Historic Trail had 496,246 visitor days in 1980 (Utah Division of Parks and Recreation 1980). On July 24 of every year, a cross-country marathon race is conducted along the trail symbolizing "Pioneer Day" and the historical arrival of the Mormon pioneers to the Salt Lake Valley.

The Pioneer Monument State Park, located approximately 0.25 mile south of the study corridor, is one of the most heavily visited sightseeing areas in the Salt Lake Valley. The "This Is The Place" monument within the State Park was erected to commemorate the 100th anniversary of the Mormons' arrival in the Salt Lake Valley in 1847.

Approximately 0.5 mile east of MP 150 is the 45 acre Fort Douglas National Historic Landmark. Sightseeing enthusiasts frequent the red sandstone buildings, parade grounds, cannons, and headquarters offices.

The Red Butte Canyon Research Natural Area is located approximately 0.5 mile north of MP 150.1. The Research Natural Area, consisting of approximately 5,200 acres, is protected and closed to public use except during the fall when a special deer hunt for 200 persons is allowed. The Forest Service conducts various on-going resource baseline studies within the Research Natural Area.

The City Creek Canyon National Historic Site is located approximately 0.5 mile south of MP 153.7. This area is utilized primarily by hikers and sightseers.

For a summary of major land-oriented recreation opportunities, refer to Table 10.

Table 10

MAJOR LAND-ORIENTED RECREATION OPPORTUNITIES

Recreation Site	Location	Status	Recreation Opportunities
Devil's Rock House	3 miles east of MP 6.8	Pending designation as an outstanding natural area (by BLM Utah State Office)	Geological interest, sightseeing
Ouray National Wildlife Refuge	MP 18 through 21	National Wildlife Refuge	Deer and waterfowl hunting, nature study, bird watching
Bottle Hollow Resort	14 miles north of MP 37	Administered by the Ute Indians	Camping
Dominguez-Escalante Trail	MP 48	Proposed National Historic Trail	Hiking
Starvation Reservoir	3 miles south of MP 64	State of Utah	Camping
Uinta National Forest	MP 95.4 to 109	U.S. Forest Service	Dispersed recreation
Wolf Creek campground	MP 102	U.S. Forest Service	Camping
Wasatch National Forest	MP 144 through 149	U.S. Forest Service	Camping
Mormon Pioneer National Historic Trail	MP 142 through 149	National Historic Trail	Hiking
Emigration Canyon	MP 142 through 149	National Register of Historic Places	Hiking, sightseeing, picnicking, and snowplay
Pioneer Trail State Park	0.5 mile south of MP 149	State of Utah	Sightseeing
Fort Douglas National Historic Landmark	0.5 mile east of MP 150	National Historic Landmark	Sightseeing
Red Butte Creek Canyon	0.5 mile north of MP 150.1	Research Natural Area	Hunting and hiking
City Creek Canyon	0.5 mile south of MP 153.7	National Historic Site	Hiking and sightseeing

Table 10 (cont'd)

MAJOR LAND-ORIENTED RECREATION OPPORTUNITIES

Recreation Site	Location	Status	Recreation Opportunities
Fort Douglas National Historic Landmark	0.5 mile east of MP 150	National Historic Landmark	Sightseeing
Red Butte Creek Canyon	0.5 mile north of MP 150.1	Research Natural Area	Hunting and hiking
City Creek Canyon	0.5 mile south of MP 153.7	National Historic Site	Hiking and sightseeing

Source: Bureau of Land Management, Division of Environmental Impact Statements Services, Denver, Colorado, George Detsis - Environmental Specialist, 1982.

2.10 WILDERNESS

No wilderness area(s) or any area under formal wilderness review, study, or appeal would be directly or indirectly affected by the Salt Lake City Alternative Product Pipeline or any other alternative project-related component (FS 1979; BLM 1981c).

The closest designated Wilderness Area, the Lone Peak Wilderness Area administered by the U.S. Forest Service, Wasatch and Uinta National Forests, is approximately 12 air miles to the south between MP 144 and 149 in Emigration Canyon (Williams 1982).

2.11 CULTURAL RESOURCES

Recorded Sites

Until 1973, much of the responsibility for recording historic and prehistoric sites in the State of Utah was assumed by the University of Utah, Department of Anthropology. All of the information which was gathered is stored in a computer at the Anthropology Department Laboratory. In 1973, the Utah State Historical Society (Division of State History) was formed and it assumed the responsibility of recording historic and prehistoric sites for the State of Utah. This information is stored both on computer and on hand-written forms at the Utah State Historical Society in Salt Lake City. A Master Cultural Resource Atlas has also been kept on which all historic and prehistoric sites for the State of Utah, that have been assigned state site numbers, have been plotted. The cultural resource records at both these institutions were checked for any sites that might lie within 0.5 mile on either side of the pipeline along its entire length. According to these records, there are 16 sites located along the pipeline route that have been assigned state site numbers. These sites and their locations are listed in Table 11. Two of these sites (42SI144 and 42SI154/64) are known to be on the National or State Register of Historic Sites. (Refer to Appendix G for information on Sources of Cultural Resource Information and Cultural Sequence - Prehistory and History.)

Historic Site Monuments/Markers and State Parks

The Daughters of Utah Pioneers place markers and monuments throughout the State of Utah to commemorate the location of various historic sites or to commemorate the point at which an historic event may have taken place. These markers or monumemts do not necessarily mark the exact location of an historic site or an event. Quite often these monuments and markers will state that the site was located somewhere near the point where the monument or marker is placed but an exact site location may not be given. Monuments and markers commemorating historic events are often based on legend, (e.g., This Is The Place Monument is located at the foot of Emigration Canyon and marks the site of a quote supposedly made by Brigham Young as he looked over Salt Lake Valley). The alternative route would transect three monuments and markers, one state park, and one military reservation. Their names and locations are listed in Table 12. None of the monuments and markers listed are known to have a state site number.

National/State Register of Historic Sites

Records kept by the Utah State Historical Society, concerning sites listed on the National and State Registers of Historic Sites indicate that four additional sites which would be located along the alternative pipeline route (besides 42SI44 and 42SI54/64) are listed on the National Register of Historic Sites. There names and locations are listed in Table 13. All sites listed on the National Register of Historic Sites are automatically placed on the Utah State Register of Historic Sites, but the reverse is not true. None of these additional sites are known to have assigned state site numbers.

The Pioneer Limekiln site is currently being nominated for listing on the State and National Register.

Table 11

RECORDED CULTURAL RESOURCE SITES

State Site Number	Type of Site	Material Found	Location [a]	Coordinates
42Dc3	Petroglyph	Rock Art	Myton	Sec. 7, T.4S., R.1W.
42Dc4	Lithic Scatter	Chipping Debris	Myton	Sec. 7, T.4S., R.1W.
42Dc245	Rockshelter	Charcoal, burnt bone, fired clay	Talmage	Sec. 19, T.2S., R.5W.
42Dc252	Historic Homestead	Log cabin, outbuilding, garbage dump, glass, tin cans, china, farm machinery	Talmage	Sec. 20, T.2S., R.5W.
42Dc254	Historic Dugout	Structure, nails, tin cans	Bridgeland	Sec. 5, T.4S., R.2W.
42Dc347	Historic Ranger	Structures, fences	Hanna	Sec. 19, T.1N., R.8W.
42Dc606	Historic Farmstead	Structure, wood, glass, porcelain, tin cans, nails	Randlett	Sec. 15, T.4S., R.2E.
42S130	Burial	Burial	Ft. Douglas	Sec. 3, T.1S., R.1E.
42S144	Historic Ceramic Scatter	Earthenware, ironstone, glass, procelain, metal fragments	Mountain Dell	Sec. 35, T.1N., R.2E.
42S154/64 (Site double numbered)	Historic Pioneer Trail	Trail	Ft. Douglas	Sec. 1, 11, 12, T.1S., R.1E. Sec. 5, 6, T.1S., R.2E. Sec. 32, T.1N., R.2E.

Source: USDA Forest Service, Ashley National Forest, Vernal, Utah, Marilyn Mlazovsky - Forest Archeologist, 1982.

[a] USGS 7.5 minute topographic map.

Table 11 (cont'd)

RECORDED CULTURAL RESOURCE SITES

State Site Number	Type of Site	Material Found	Location [a]	Coordinates
42Sm44	Historic Japanese Monument	Stone Monument	Soapstone Basin	Sec. 33, T.3S., R.8E.
42Un527	Campsite	Fire circles, glass, procelain, flakes	Pelican Lake	Sec. 2, T.4S., R.2E.
42Un529	Campsite	Fire circles, glass porcelain, flakes	Pelican Lake	Sec. 2, T.4S., R.2E.
42Un530	Campsite	Fire circle, glass, flakes	Pelican Lake	Sec. 2, T.4S., R.2E.
42Un531	Unknown	Unknown	Pelican Lake	Sec. 2, T.4S., R.2E.
42Un609	Petroglyph	Rock Art	Pelican Lake	Sec. 10, T.4S., R.2E.

Source: USDA Forest Service, Ashley National Forest, Vernal, Utah, Marilyn Mlazovsky - Forest Archeologist, 1982.

[a] USGS 7.5 minute topographic map.

Table 12

HISTORIC SITE MONUMENTS/MARKERS AND STATE PARKS

Monument/Marker Name	Location [a]	Coordinates
Camp Grant Historic Site	Mountain Dell	Sec. 3, T.1S., R.2E.
Last Camp Historic Monument	Mountain Dell	Sec. 33, T.1N., R.2E.
This Is The Place Monument	Ft. Douglas	Sec. 10, T.1S., R.1E.
Pioneer Monument State Park	Ft. Douglas	Sec. 11, T.1S., R.1E.
Fort Douglas Military Reservation	Ft. Douglas	Sec. 2, 3, T.1S., R.1E. Sec. 24, 25, 34, 35, 36, T.1N., R.1E. Sec. 19, 30, T.1N., R.2E.

Source: USDA Forest Service, Ashley National Forest, Vernal, Utah, Marilyn Mlazovsky - Forest Archeologist, 1982.

[a] USGS 7.5 minute topographic map.

Table 13

SITES LISTED ON THE NATIONAL AND STATE REGISTER OF HISTORIC SITES

Name of Site	Type of Site	Location [a]	Coordinates
Mountain Dell Reservoir	Historic Dam	Mountain Dell	Sec. 3, 9, 10, T.1N., R.2E.
Fort Douglas	Historic Military Fort	Ft. Douglas	Sec. 3, T.1S., R.1E.
Nells Hall House	Historic House	Ft. Douglas	Sec. 33, T.1N., R.1E.
Avenues Historic District	Historic Housing District	Ft. Douglas Salt Lake City North	Sec. 32, T.1N., R.1E.
Emigration Trail (42Sl54/64)	Historic Pioneer Trail	Ft. Douglas	Sec. 1, 11, 12, T.1S., R.1E. Sec. 5, 6, T.1S., T.2E. Sec. 32, T.1N., R.2E.
Mountain Dell Historic Site (42Sl44)	Historic Ceramic Scatter	Mountain Dell	Sec. 35, T.1N., R.2E.
Pioneer Limekiln (under current nomination to State and National Register)	Historic limekiln	Ft. Douglas	Sec. 33, T.1N., R.1E.

Source: USDA Forest Service, Ashley National Forest, Vernal, Utah, Marilyn Mlazovsky - Forest Archeologist, 1982.

[a] USGS 7.5 minute topographic map.

2.12 VISUAL RESOURCES

The visual quality of the alternative pipeline corridor has been characterized according to the BLM Visual Resource Management (VRM) System (BLM 1980a) and/or the Forest Service Visual Management System (FS 1974b). Both systems evaluate basic qualities of form, line, color, and texture in the landscape. Visual qualities are indicated for various segments of the pipeline corridor on the Profile and Data Sheets (Figures 4 through 10) using the Forest Service designations within the National Forests and the BLM designations elsewhere.

The corridor can be divided into three physiographic and six visually distinct areas of the natural landscape: the central Uintah Basin and the western Uintah Basin of the Colorado Plateau Province; the river canyons, the mountain valleys, the Wasatch front canyons of the Middle Rocky Mountain Province; and the Salt Lake foothills of the Basin and Range Province.

The central Uintah Basin, near the proposed Tosco Sand Wash site, can be described as a gently rolling, visually unobstructed landscape. Form is represented by softly irregular hills; line is portrayed by soft horizons, occasional rock ledges, and the White River corridor; color is generally muted soil greys, with light browns and greens, except for the bright greens of the relatively narrow floodplain of the White River; and texture generally is soft, without dramatic light/shadow contrasts. Existing cultural modifications are generally lacking, except for occasional dirt roads and oil/gas exploration sites.

The western Uintah Basin also presents an open visual character; however, it features greater variety than the landscape to the east. Form is comprised of irregular benches, ridges, and drainage valleys with the perceptible Uinta Mountain background to the north; line is evident with the Green and lower Duchesne rivers and in agricultural land patterns; color reflects sagebrush greys, the winter browns and summer greens of agriculture, and the bright greens of trees and shrubs along the many drainages; and texture is soft to moderate with the riparian vegetation providing noticeable contrast. Existing cultural modifications reflect small communities, farmsteads, and agricultural activities interspersed with range land.

The river canyons include the upper Duchesne River and its tributaries and the upper Provo River and its tributaries. The landscape form is represented by the wide variety of terrain in canyon width, steep hillsides, side ravines, and surrounding ridges; line is most dramatically provided by the orientation of the canyon and the rivers and creeks; color varies from sage grey to the yellow greens of aspen and dark greens of conifers; and texture is often dramatic as shade/sunlight patterns unfold in vegetation and terrain. Existing cultural modifications are comprised of access roads and forest recreation facilities, with agricultural activities centered in the canyon bottoms.

The mountain valleys in the Kamas and Parley's Park areas give the visual impression of meadow green set amidst the mountain peaks. Form is established by the surrounding hills in delineating the size and shape of the valley areas; line (except along the horizon) is subtle as valleys, sidehills, and

side drainages tend to be integrated; color includes meadow greens of the valleys, both native grasses and hay fields, grey greens and dark greens of the mountain, as well as grey browns and dark browns of ridge or mountain rock outcrops; texture generally tends to be moderate within the valleys but more varied around the edges where terrain and vegetation contrasts exist. Existing cultural modifications include small communities and farms, with growing subdivisions and recreation features in the Parleys' Park area.

The Wasatch front (upper Parley's Canyon and Emigration Canyon) provides a rather steep transition between the mountain setting and the Salt Lake valley. Form is established by the canyons which are somewhat open at the top but become more narrow near the bottom; line is generally determined by the westerly direction of the canyons and by the water courses in the canyon bottoms; color is basically the grass or mountain brush greens and browns with occasional dark conifer green; texture is provided in the grass/oakbrush contrast but it is most noted along the creek in Emigration Canyon where riparian vegetation and varied terrain create interest and shadow pattern. These canyons have existing and expanding cultural modifications representative of the Salt Lake City urban fringe.

The Salt Lake foothills provide a visual resource which, for the most part, has been subordinated by the Salt Lake City urban development. Nevertheless, the foothills add to the perception of open space as part of the Wasatch Mountain background for the city. Form is portrayed by the irregular foothill terrain which provides transition to the higher mountains; line is indistinct except in local drainages such as Red Butte and City Creek Canyons where linear terrain orientation is present; color is mostly the seasonal green and soft browns of foothill grasses except where brighter greens and darker browns occur with brush in local drainages; texture is generally plain and soft outside of the local drainage bottoms.

2.13 GEOLOGY AND PALEONTOLOGY

The 160-mile-long pipeline would cross geologic formations ranging in age from approximately 300 million years to recent. Approximately 106 miles would lie in an area of low seismic risk where only minor damage to structures from earthquake are expected, 20 miles would lie on the southern slope of the Uinta Mountains where moderate damage may be expected, and 32 miles in the Wasatch Mountains where major damage to structures could result from earthquakes. Ranking of seismic risk is taken from Algermissen (1969). The pipeline would cross known faults approximately 11 times and a suspected fault would be crossed once (Stokes, et. al. 1961-1962). Of the 12 fault crossings, 10 would occur in the Wasatch Mountains and 2 are on the Wasatch fault zone near the Salt Lake Valley floor at mileposts 151 and 159, near the University of Utah and at I-15. The faults in the Wasatch Mountains are believed to have been stable for several million years but faults near the Salt Lake Valley Floor have experienced movement 1-3 times in the past 2,000 years. Risk of movement on these faults is estimated as one chance in the next 50 years (Olsen 1982).

Two areas of severe erosion potential and mass soil movement occur along the route at MP 94 to 97.4 and 97.4 to 109.4. Even though the slump area is continuous, two areas are identified, since the area between MP 97.4 and 109.4 is steeper and presently shows evidence of soil creep and slumping.

No active mining operations would be crossed by the pipeline, but approximately 15.5 miles of the route would cross producing oil and gas fields (mileposts 0 through 9.8, 10 through 12, 58 through 62, and 65 through 66). An inactive coal operation at Red Creek and phosphate potential near Hanna exist under Ute Tribal administration. The coal beds in this area are found in the Cretaceous Frontier Sandstone and Mesa Verde Formations, both of which are located outside of the one mile study corridor, i.e.; the coal outcrops are located outside of the Duchesne River Valley, mainly on the canyon walls of tributaries to the Duchesne River (Doelling and Graham 1972). Therefore, no impacts to future coal lease developments in this area would result from pipeline installation. The pipeline corridor would cross the southernmost edge of a known phosphate deposit for 0.25 mile between MP 91 and 93. The phosphate occurs in the Permian Park City formation.

An estimate of the paleontological importance of the potentially affected formations is given by milepost on the Profile and Data Sheets (Figures 4 through 10). The information provided is based on literature and known fossil occurrences in the geologic formations that would be crossed. The methodology and importance ratings of High (H), Medium (M), Low (L), and Negligible (N) are taken from Madsen (1980). Appendix H further explains the importance rating system.

The 160-mile-long pipeline route crosses approximately 40 miles of geologic formation with high, 38 miles with medium, 68 miles with low, and 14 miles with negligible probability of important fossil occurrence.

Table 14

2.14 EXISTING LAND USE PLANS, CONTROLS, AND RECOMMENDATIONS

Table 16 depicts those known land use plans, the locations along the pipeline route and plan recommendations associated with a 1-mile wide study corridor for the alternative product pipeline proposal.

Plan	Milepost	Plan Recommendation
1. Rainbow Management Framework Plan, Bureau of Land Management, Vernal District		
White River	6.7	No crossing, 1 mile wide protection corridor
Green River	20.4	Same as White River
2. Nationwide Rivers Inventory, Phase 1, formerly the Heritage Conservation and Recreation Service and currently the National Park Service		
White River	6.7	No adverse impacts upon "natural, cultural, or recreation" values as a potential candidate for National Wild and Scenic River designation.
Green River	20.4	Same as White River
3. Ouray National Wildlife Refuge, U.S. Fish & Wildlife Service	18-21	Minimize environment impact to wildlife and wildlife habitat.
4. Uintah & Ouray Indian Reservation Ute Indian Tribe	21-27; 36-40 (grazing); (water)	Minimize environmental impacts to grazing, fishing on the Duchesne River, and (Ute Tribal water rights in the region.
5. Dominguez-Escalante Trail proposed National Historic Trail under the National Trail Systems Act	48	Minimize environmental impacts to trail.
6. Uinta National Forest Travel Plan	95.4-109	No off-road vehicle (ORV) use along right-of-way.

Table 14 (cont'd.)

Plan	Milepost	Plan Recommendation
7. Uinta National Forest - Heber City Ranger District Multiple Use Plan, Forest Management Units	96-97.4	Wolf Creek geological area, cliffs
	96-97.4	Oil pipeline
	100.4	Potential recreation campgrounds
	100.4	Turnout for panoramic view
	101	Timber clearcut demonstration area
	104	Slide area
	104	Japanese Pilot Historic Monument
	107	Provo River Stream crossing critical area
	108	Nobletts Area, geological area
8. Uinta National Forest Proposed Forest Management Plan and Draft Environmental Impact Statement	95.4-109	Recommended utility corridor. Along the current pipeline alignment, construction width would not exceed 75 feet. Right-of-way width will be the minimum to serve facility (Uinta Forest Management Plan, pg. 3-94). The plan also covers all resource management practices with associated standards and guidelines for the area covered by the pipeline.
9. Wasatch National Forest Travel Plan	144-149	No off-road vehicle (ORV) use along the right-of-way.
10. Wasatch-Cache National Forest Utility Corridor Evaluation (part of the proposed Forest Management Plan)	144-149	Recommended as a utility corridor with the following guideline: a) Management of ORV's is a major problem related to underground utilities. Recommendation: Barriers on all access roads are imperative. Revegetate all disturbed areas with native plants. No surface utilities should be allowed because of visual degradation.
11. Salt Lake County Planning and Zoning Ordinance	138-157	Foothills Preservation Ordinance, Title 22, Chapter 35 prohibiting any development in Emigration Canyon on natural slopes of greater than 40 percent.

Table 14 (cont'd.)

Plan	Milepost	Plan Recommendation
12. Mormon Pioneer National Historic Trail under the National Trail Systems Act	142-149	Minimize environment impacts to trail.
13. Emigration Canyon - National Register of Historic Places	142-149	Minimize environment impacts to canyon.
14. Little Dell Reservoir proposed by the U.S. Army Corps of Engineers	142	Dam site conflict with proposed pipeline.
15. Salt Lake City Planning and Zoning Ordinance	149-157	City Site Development Ordinance (August 1981) Title 47, Chapter 5, Independent Site Development Activities. No development on natural grade slopes of greater than 40 percent.
16. Salt Lake City Council proposed annexation of Emigration Canyon to be decided by June 15	142-149	In addition to the existing 258 homes in the Canyon, a potential of 750 new homes with annexation.
17. University of Utah - Master Plan for Facility Expansion (1981)	151-152	Potential new buildings and parking area.
18. Salt Lake City, Water Resources Board, City Creek Canyon	153.6	Water Resources Board's policy to prohibit any construction activity in the watershed of City Creek Canyon.

Source: Bureau of Land Management, Division of Environmental Impact Statements Services, Denver, Colorado, George Detsis - Environmental Specialist, 1982.

Chapter 3: SALT LAKE CITY ALTERNATIVE PRODUCT PIPELINE - ENVIRONMENTAL CONSEQUENCES

This chapter discusses the environmental consequences to resources which would occur from the construction and operation of the Salt Lake City Alternative Product Pipeline. The impacts are discussed by resource in the same order as given in Chapter, Affected Environment.

References to mitigation measures in this section apply to federally administered lands and Indian Reservation lands (Cuch 1982b) that would be crossed by the pipeline. Application of the measures on private land would depend on the terms established between the applicant and landowners. Therefore, statements in this section on resource impacts (quantity and duration) may or may not apply to private lands. Potential impacts from pipeline breakage and oil spill for each resource are discussed in Appendix A rather than covered in the following narratives.

3.1 SOCIOECONOMICS

Construction of the Salt Lake City Alternative Product Pipeline would not create significant socioeconomic impacts based on the following interrelated factors:

1. The pipeline work force would be relatively small (100 workers) in comparison to existing populations, particularly when considering the influencing effect that Salt Lake County has on the other counties.

2. Construction along the pipeline corridor would be mobile, therefore, impacts from construction crews would be temporary in small, local communities. The main base for pipeline construction crews would likely be in Salt Lake City; otherwise the work force would tend to be transient, utilizing existing contractor trailers or commercial accommodations. Some workers would use developed mobile home (camp) facilities which would be located in communities along the pipeline route. Some workers would also use existing motel or rented room facilities. These workers would place short-term (1 to 2 weeks) impacts on existing domestic facilities (restaurants, laundromats, etc.). There would also be an increased use of nearby outdoor recreation resources. (Refer to the Recreation Resources section of this Chapter).

3. The counties which would be affected by construction of this alternative are already accustomed to construction associated socioeconomic impacts. Impacts from construction of this alternative would be insignificant when added to other projects in the region at the time of pipeline construction.

3.2 AIR QUALITY

Pollutants emitted during construction of the alternative pipeline would depend upon the type, amount, and extent of equipment use. Generally, the emissions resulting from pipeline construction include non-methane hydrocarbons (HC's), nitrogen oxide, carbon monoxide, sulphur oxide, total suspended particulates (TSP), and water vapor (refer to the UBS-DEIS for

quantities). Dispersion of these pollutants would depend upon local atmospheric stability and meterological conditions.

Construction would cause temporary and minimal deterioration of the ambient air quality. It would also cause localized, short-term fugitive dust conditions. Almost all surface construction produces varying amounts of dust, depending upon soil moisture conditions, wind velocity, and the activity taking place. While the severity and duration of any potential impact is difficult to predict, fugitive dust would not be a significant problem due to the use of dust control measures (water and oil sprays).

However, if proper dust suppression techniques were not implemented, some minor violations of the National Ambient Air Quality Standards for TSP could occur, especially in Salt Lake County which is in non-attainment status for TSP. Unauthorized public use of the access roads and rights-of-way by off-road vehicles could aggravate surface disturbance.

Open burning of vegetation along the alternative route might be necessary to dispose of some debris resulting from clearing operations. If this were done, some short-term air pollution would occur. The applicant would be required to obtain the appropriate state and local air quality/burning permits.

Pollution from pipeline construction would add to the existing air quality problem, especially during air inversion periods in the Uintah Basin and Salt Lake Valley areas. Air quality degradation is becoming a special concern to residents of these areas.

No significant air quality impact would occur from operation of the alternative pipeline. Potential for pollution from burning of spilled oil is noted in Appendix A.

3.3 NOISE

Pipeline construction would cause a temporary impact on noise quality. Maximum noise levels recommended by the Environmental Protection Agency are presented in Table 15. The specific noise levels would depend on the equipment involved; the impact would depend on the location of the potential receptors (people or animals). Noise levels from construction machinery would be typical of those associated with shallow digging and earth moving operations. Typical noise levels for the various kinds of construction equipment to be used are presented in Table 16. Typical noise levels attributable to a construction spread are about 70 dB(A) at 250 feet from the pipeline and 50 dB(A) at 2,500 feet. Any receptor adjacent to the right-of-way would be affected only while construction crews are working in the area.

Table 15

Maximum Noise Levels Recommended by EPA

Effect	24-Hour Average Noise Level (dB(A))
Hearing Loss	70
Outdoor Activity Interference and Annoyance	55
Indoor Activity Interference and Annoyance	45

Source: BLM and FERC 1981

Table 16

Typical Pipeline Construction Equipment Noise Levels

Equipment	dB(A) at 50 Feet
Side Boom	78-92
Backhoe	80-92
Bulldozer	82-95
Ditching Machine	80-90
Motor Crane	78-87
Dragline	80-90
Backfiller	82-95
Welding Rig	72-82
Air Compressor	85-91
Jack Hammer	88-98
Trucks (Heavy Duty)	82-92
Pickup Trucks	70-85
Scraper Grader	80-94
Generator	71-82

Source: BLM and FERC 1981

Most pipeline construction equipment would exceed the existing background levels and the interference and annoyance levels by a considerable amount, in some instances almost doubling acceptable levels. However, construction noise would not be expected to be a problem over most of the pipeline length due to the distance from those who would be potentially affected. Comparing Tables 3, 15, and 16, it can be seen that noise would be of short-term concern where the pipe centerline would be in proximity to residential, educational, recreation, and commercial (or office) activities.

If blasting is necessary in order to excavate hard rock formations, sound levels would be momentarily or periodically elevated. Blasting would need to be conducted only during daylight hours to reduce possible disturbance.

In certain instances coordinated scheduling may be necessary to avoid major noise conflicts and key activities along the right-of-way. Most likely areas for this coordination would be near Myton, Tabiona, Hanna, Francis, Emigration Canyon, Pioneer Monument State Park, Fort Douglas, the University of Utah, and adjacent residential areas along the Salt Lake City foothills.

3.4 WATER RESOURCES

To predict where sediment would be deposited and in what quantities would require a knowledge of: (1) the quantities of material discharged into the flow at the point of disturbance, (2) the sizes of the particles disturbed, (3) the flow velocities as a function of distance along the stream, (4) the effects of varying flows on stream velocities (note: sediment transport in a stream is a never-ending process as each successive surge of flow would pick up and redeposit sediment at a different location), and (5) how the deposited sediment would affect the streamflow characteristics. The stream's depth, resistance to flow, and cross-section would be changed with each successive deposition of sediment.

Any increase in turbidity in domestic water sources (streams rated 1C, protected for domestic purposes with prior treatment by standard complete treatment processes as required by the Utah State Department of Health, Table C-1, Appendix C, under State Water Quality Standards) could temporarily affect municipal water treatment plants. It is believed that these impacts are insignificant since turbidity fluctuations are common (e.g., rainstorms, etc.). No stream which would be crossed by the alternative has been rated 1A (protected for domestic purposes without treatment) or 1B (protected for domestic purposes with prior disinfection). An increase in turbidity on a 1A or 1B stream would be an adverse impact since no filtration is provided on such water sources. (Definitions for stream classifications are found in Appendix C.)

The major concern with a pipeline stream crossing is the disruption of the streambed and the increase in sediment movement. The sediment that is dislodged during construction finds three avenues for transport: the bedload, the dissolved load, and the suspended load. Both the bedload and the dissolved load would be little affected by trenching through the streambed, but the suspended load could be significantly altered. The distance the

To gain some appreciation for the amount of sediment which could occur due to disturbance of the streambed, an example is taken from construction done in a nearby watershed (Bengeyfield 1979). Refer to Figure 11 which depicts suspended sediment in a stream before, during, and after construction. Of particular interest to this project are the rises in suspended sediment concentrations found during 1977. In the subject report on page 10 the author states, "In 1977 the three major peaks are due to activities within the stream channel such as diversions and culvert installations." The diversions mentioned are understood to be relatively small cofferdams which divert the flow around the stream area being worked. It is expected that similar rises, or spikes, in sediment concentrations would occur from construction activity in the streams which would be crossed by this pipeline. The previous study indicates that the increased sediment concentrations lasted approximately 1 to 2 weeks but then returned to near normal levels. This would suggest that the same interval could be expected from the construction of the alternative pipeline route.

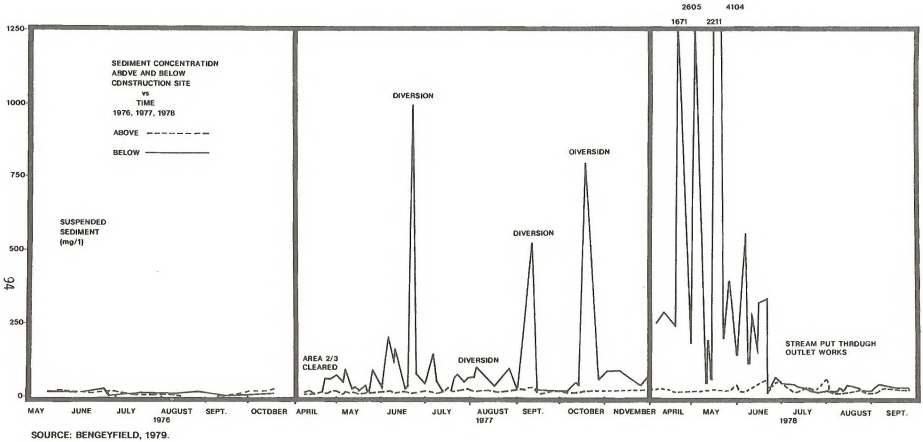
The East Fork of Smiths Fork River, studied in the above referenced report, is considered to be typical of the steeper sloped streams. It is expected that streams with shallower slopes and less velocity would not "flush" the disturbed sediment as quickly as faster streams. Also, it is more likely that sediment would form bars in the slower streams and influence changing channel characteristics. The section on aquatic wildlife addresses the effect of sediment on stream organisms. Chapter 4, Mitigation Measures, addresses methods which would alleviate some of the problems of induced sediment. Pipeline construction is not expected to affect downstream salinity to any measurable degree.

Floodplains

Except for shale oil storage tanks at each end of the pipeline, the only structures proposed to be built aboveground are three pump stations. One of these pumping stations would be in a floodplain (pump station NW of Hanna, MP 88) and it would need to be designed to avoid damage from flooding.

Ground water

The pipe would be buried a minimum of 4.5 feet deep except at stream crossings where it would be buried 6 or more feet below the streambed. It is not anticipated that the pipeline would affect ground water. However, it was reported by the Salt Lake County Water Department that some residents in Emigration Canyon get their water from shallow springs. A pipeline trench across a spring area could interrupt flow from the springs.



SOURCE: BENGEYFIELD, 1979.

FIGURE 11

SEDIMENT BELOW CONSTRUCTION SITE

3.5 VEGETATION, SOILS, AND RECLAMATION

Vegetation

Vegetation that would interfer with construction along the 60-foot wide pipeline right-of-way would be removed. Analysis assumptions are stated for clearing operations under each vegetative type.

Forest

One hundred sixteen acres of forest vegetative type would be disturbed by project construction activities. Vegetation would be removed completely from a 35-foot construction right-of-way and the remaining 25 feet would be scraped by bulldozing or by cutting to provide a work and assembly area. Construction activity would result in clearing a 60-foot average width for the length of the forest type and a 100-foot or more width at stream crossings. Following construction, a 10-foot wide strip over the pipeline would be maintained and cleared of vegetation over 2 inches in diameter, to prevent damage to the pipeline coating.

Past soil disturbances in the Wolf Creek and West Fork of the Duchesne River area indicate that vegetation is slow to reestablish unless a persistent and timely revegetation program is carried out. A potential for mass soil movement also exists within portions of this type which could result from land disturbing activities (Muir 1976).

It could require from 5 to 10 years to successfully reestablish grasses, forbs, and brush seedlings over the pipeline right-of-way. Brush would be managed for natural reestablishment and would require 20 to 40 years to grow to previous heights and proportions. Tree growth would be removed periodically from the area immediately adjacent to the pipeline; the remainder of the right-of-way would be managed for tree growth. Approximately 150 to 300 years would be required to restore conifer trees to the preconstruction heights and densities and 30 to 75 years for similar restoration of aspen.

The importance of the forest vegetation type is for wood products, watershed, recreation, wildlife habitat, and grazing.

Mountain Brush

Pipeline construction activities would disturb 218 acres of this vegetative type. Vegetation would be removed from the surface during construction as explained in forest type vegetation. Following construction, the area would be subject to erosion until grasses, forbs, and brush seedlings were successfully reestablished. Depending on slope, aspect, and precipitation, successful revegetation could result within 1 to 5 years.

Successful re-establishment of grasses, forbs, and brush species would depend on a persistent and timely revegetation program. Approximately 20 to 40 years would be required for mountain brush to return to its original condition. As with the forest type, the area over the pipeline would be kept free of vegetation growth which was over 2 inches in diameter.

Values associated with the mountain brush type are primarily watershed, wildlife, recreation, and grazing.

Sagebrush

Forty-four acres of sagebrush type would be disturbed by pipeline construction activities. The construction activities would remove all the vegetation from the 35-foot construction right-of-way. Brush in the remaining 25 feet of right-of-way would be removed or trampled only as necessary.

The big sage vegetation located in the West Fork of the Duchesne River grows on shallow to moderately deep soils that are classified with a high to very high erosion hazard (Muir 1976). Past soil disturbance to big sage vegetation indicates that vegetation is slow to reestablish unless a persistent revegetation program is carried out. A potential for mass soil movement also exists within portions of this type. Existing soil creep and slumping are evident and would impede successful revegetation efforts (Muir 1976).

The big sage vegetation located in the Parley's Park area can be revegetated without difficulty. The period for successful reestablishment of grass, forb, and sagebrush seedlings would be similar to that discussed under the forest type. The area would return to the preconstruction sagebrush type within 15 to 30 years.

This sagebrush type is mainly used as watershed and wildlife habitat. Grazing is restricted in the West Fork of the Duchesne River area due to the high soil erosion hazard (Muir 1976).

Pinyon-Juniper

Twenty-nine acres of pinyon-juniper type would be disturbed by pipeline construction activities. Vegetative clearing and right-of-way maintenance would be conducted as explained in the section on the forest type. Successful reestablishment of grasses, forbs, and brush seedlings could result within 1 to 5 years. If the area is managed for natural regeneration of juniper trees, it would require 75 to 150 years to attain original stand proportions.

Saltbush-Greasewood

Pipeline construction activities would disturb 308 acres of this vegetative type. A width of 35 feet or less would be cleared through this vegetation type for construction; the remainder of the right-of-way would be cleared only as necessary. Approximately 3 acres of vegetation would be cleared from the pump station location at MP 44.

Reseeding of the saltbush-greasewood vegetation type in this area is difficult to achieve or not feasible because of limited rainfall (Leishman 1982). Areas where revegetation potential is fair to good (Leland Bench area) would respond to reseeding within 1 to 5 years if precipitation rates and periods were adequate and timely. The area occupied by this type is sparsely vegetated with vegetation generally left to reseed naturally. Annual species of invader

plants would establish themselves in 1 to 5 years, with the overstory requiring 20 to 40 years depending upon precipitation patterns.

Primary use of this type is for limited livestock grazing and wildlife habitat. Natural water sources are limited to the stream and wash crossings in the area.

Sagebrush-Saltbush

Eighty-seven acres of this vegetative type would be disturbed by pipeline construction activities. Vegetative clearing would be similar to that applied to the saltbush-greasewood type.

Generally, areas within the sagebrush-saltbush type respond well to reseeding; successful reestablishment of grass and brush seedlings could result within 1 to 5 years. As with the saltbush-greasewood type, annual invader species would establish themselves within the same time period. The overstory would become reestablished within 10 to 20 years.

Primary use of this type is for livestock grazing and wildlife habitat.

Annual Grasses

There would be 15 acres of annual grass areas disturbed by the project. Vegetative clearing would be similar to that applied to the saltbush-greasewood type. The area occupied by this vegetation responds well to reseeding, with successful reestablishment of grass, forbs, and brush seedlings occurring within 1 to 2 years.

Perennial Grasses

Construction of the alternative would disturb 22 acres of perennial grass areas. Vegetation clearing would be similar to that applied to the saltbush-greasewood type.

Although areas where this vegetation is found respond well to reseeding, high soil erosion hazards require proper site preparation and a thorough revegetation effort. Successful reestablishment of grasses, forbs, and brush species could occur within 1 to 2 years.

Primary use of this vegetation is for watershed, wildlife habitat, and recreation.

Riparian Vegetation

Construction of the alternative could disturb 84 acres of riparian vegetation. Riparian vegetation identified by streams (Appendix C), would be affected within the working width of the right-of-way. Following construction, grasses and sedges would reestablish along the wet areas within 1 to 2 years. Brush would resprout and complete regrowth would be anticipated within 5 to 10 years. Larger willows, cottonwood trees, and salt cedar would require periods of 10 to 25 years to reestablish themselves.

Planting willow cuttings and cottonwood seedlings will hasten regrowth and also prevent invasion of less desirable species into the disturbed areas. Grasses and other species of plants adapted to the site would also be planted. Since riparian vegetation is an important resource in the western United States, stream crossing locations, construction techniques, and rehabilitation techniques should be closely monitored to ensure compliance of measures specified in the mitigation measures.

Timber Resource

Refer to tables 17 and 18 for the quantities and dollar values assigned to the total volume of commercial timber and miscellaneous forest products potentially generated by construction of the pipeline route.

Values of fuelwood and Christmas trees are based upon sale by individual permits issued by the Forest Service at $2.50 per cord and $2.00 per Christmas tree. Larger commercial sales have been negotiated at $16.00 per cord (BLM and FERC 1981) and sold on the open market in Salt Lake City.

Values of commercial timber are based on recent comparable timber sales to timber industry in the area. Affected commercial timber would be 46 percent of the Uinta National Forest annual timber cut (for one year). Affected fuelwood volumes would be 10 percent of the total volume found within the forest.

Approximately 84 acres of commercial timber and miscellaneous forest products would be disturbed by construction of the alternative pipeline route.

The Uinta National Forest Timber Management Plan would need to be revised to reflect changes in site conditions resulting from pipeline rights-of-way sales. Such changes could affect the scheduled timber sale program on the Forest, i.e., unscheduled timber removal affects programs that are designed to provide a continuous timber product supply to the public over time as well as meet the silvicultural requirements of the timber stand.

Threatened and Endangered Plant Species

Vegetation would be destroyed within the construction area and trampled in the assembly and stringing portion of the right-of-way. Since the exact alignment is unknown, no conclusive statements can be made concerning impacts to a species or population.

Upon establishment of the pipeline alignment, a biological survey would be conducted to determine if any plants would be affected. If it is found that impacts to a species would occur, formal Section 7 consultation procedures would be initiated by the BLM, the FS, and the U.S. Fish and Wildlife Service (FWS). These procedures would result in establishing methods of protecting the species from impacts which could occur as a result of pipeline construction.

Table 17

Commercial Timber Areas

Location	Total Miles	Tree Species	MBF/AC[a]	Volume[b] Affected (MBF)	Value
MP 97.4-101.9	4.5	Spruce/Fir & Aspen	25	818	$24,540
MP 102.9-104.9	2.0	Aspen	4	58	290
MP 105.9-106.9	1.0	Aspen	4	29	245
MP 107.9-108.9	1.0	Aspen	4	29	145
Total	8.5		37	934	$25,120

Source: Dennis B. Jensen, Forester, Heber Ranger District, Uinta National Forest (1982).

[a] MBF/AC = Thousand board feet per acre.

[b] Assumed 60-foot wide construction right-of-way.

NOTE: Over the life of the project (35 years), annual loss in volume would be 7,480 board feet valued at $149.00.

Derivations of the figures shown for Affected Standing Volumes and Annual Volume Losses were based on a worst-case analysis, i.e., there would be no overlapping of the pipeline right-of-way and the existing Chevron pipeline right-of-way; the Tosco right-of-way would be located immediately adjacent to the Chevron right-of-way.

Table 18

Miscellaneous Forest Products

Location	Total Miles	Tree Species	Cords of Fuelwood Christmas Trees[a]	Value
MP 97.4-108.9	11.5	All	1,176 Cords fuelwood 348 Christmas trees	$2,970 720
Totals	11.5	All	1,176 Cords fuelwood 348 Christmas trees	$3,690

Source: Dennis B. Jensen, Forester, Heber Ranger District, Uinta National Forest (1982).

[a] Miscellaneous forest products.

NOTE: Over the life of the project (35 years), annual loss in cords of fuelwood would be 42, valued at $108.

Refer to NOTE on Table 17; this Note also applies to Miscellaneous Forest Products.

Mileposts 52 to 97 are considered as having pertinent timber values to the Ute Tribe. No estimate has been made of the volume and associated value for this forest product area due to the low and scattered qualities per acre along the pipeline right-of-way.

Soils

The to Salt Lake City Alternative Product Pipeline would alter and disturb 1,254 acres of soils within the alternative pipeline right-of-way of which 1,164 acres would be within the 60-foot right-of way, 84 acres would be at stream crossing points, and 6 acres at the 2 alternative pump station facilities. These impacts would include disturbance of topsoil, soil compaction, disturbance of the desert pavement condition in the desert areas, sidehill cuts on steep mountain slope areas, alteration of the soil profile along the excavated pipeline trench resulting in accelerated soil erosion, and reduction in soil productivity. These impacts would affect runoff, water erosion, sediment yield, wind erosion, and soil stability as well as affect the soil as a medium for plant growth.

Impacts to soils would result primarily from an increased susceptibility to erosion or displacement. The degree of susceptibility to erosion would vary according to soil erodibility characteristics, topography, surface roughness, and the presence or absence of protective soil cover such as vegetation, plant residues, gravel cobble, or rock. The amount of erosion would be related to the time between the disturbance and reestablishment of vegetation or implementation of erosion control measures. Soil productivity could be reduced by either the loss of topsoil or the mixing of topsoil with substratum materials excavated from the trench that are high in salinity, alkalinity, other toxic materials, or unweathered parent materials.

Impacts on soils within the pipeline right-of-way would continue until erosion control and revegetation of the disturbed areas were successful. Successful erosion control and reclamation programs are dependent on appropriate measures being applied on a consistent and timely basis.

In all cropland areas and in areas of native vegetation, where climatic and soil conditions are favorable and slope gradients are gentle, successful erosion control and reclamation should be achieved within 1 to 2 years.

Soil impact potential would be greater in areas with less favorable soil and climatic conditions and in areas with steep slopes where soils are more susceptible to erosion hazards and have a lower revegetation potential (see Appendix I). Successful erosion control and rehabilitation in these areas would require consistent application of site-specific measures designed to minimize initial disturbance, control land uses on the area immediately following construction, control potential erosion sources, and establish adequate vegetative cover within a short time; desired erosion control and rehabilitation in these areas would take from 5 to 10 years.

Final pipeline alignment would avoid, where possible, highly erodible slopes and potential slide areas. This would reduce the potential for accelerated erosion and other impacts. Other areas, where adequate vegetation could not be established and maintained, would require continued application of erosion control measures (see Appendices J and K).

Impacts on Soil Groups

Soil Group 1

Pipeline construction would disturb 134 acres of Soil Group 1. Ninety-two acres of shallow to moderately deep soils on the steep sloping Uinta mountain area of the pipeline route are susceptible to poor slope stability and high erosion hazards. Sidehill cuts and fills would cause structural soil changes resulting in mass movement, slides, or increases in existing soil creep and erosion problems. Successful rehabilitation of disturbed areas would be difficult due to existing slope creep and slumping and the potential of mass wasting. Detailed information on this area is included in the Uinta National Forest Soils Report, Wolf Creek - West Fork Duchesne area (Muir 1976). These soils occur between MP 97.4 and 109.4.

Forty-two of deep soils on the Uinta and Wasatch mountain areas of the alternative pipeline route are located on gentle to moderately steep slopes. Soil characteristics, substantiated by past and ongoing land uses, indicate these soils have low erosion hazards and a good rehabilitation potential. These soils occur between MP 110.9 to 111.4 and MP 134.4 to 138.9.

Soil Group 5

Construction of the alternative would disturb 52 acres of Soil Group 5. Thirty acres are soils on gentle slopes of the plateau area south of the Uinta Mountains. Construction activities would cause moderate erosion hazards and rehabilitation potential would be good. These soils occur from MP 90.4 to 93.9.

From mileposts 93.9 to 97.4, construction would be on 22 acres of shallow soils located on the steep slopes of the previously mentioned plateau areas. These soils are susceptible to mass movement, soil slip, and slide hazards. Runoff would be rapid. Construction activities would cause soil changes leading to the above soil problems. Rehabilitation of disturbed areas would be difficult due to the poor slope stability. Detailed information on this area is also included in the Uinta National Forest Soils Report (Muir 1976).

Soil Group 21

Pipeline construction would disturb 111 acres of Soil Group 21. Construction activities would disturb 31 acres of deep soils and 80 acres of shallow stony soils on flat to gently sloping land. These soils have a fair to good rehabilitation potential and a low to moderate erosion hazard. Without special construction techniques (double ditching) construction across the shallow stony soils would bring considerable coarse fragments to the surface, creating difficulties in rehabilitation efforts. These soils occur within valley areas of the Wasatch and Uinta Mountains where many areas have been modified by agricultural activities (i.e., MP 109.4 to 110.9, MP 111.4 to 121.9, and MP 131.9 to 134.4).

Construction of the pipeline would disturb 243 acres of the Soil Groups 24 and 25. Eighty-one of the 243 acres are very shallow stony soils and some deep soils on gently rolling hills (interior Wasatch Mountain area). Soil characteristics indicate that construction activities would cause moderate erosion hazards and that the rehabilitation of disturbed sites would meet with fair success. Rehabilitation efforts would be hampered in areas with large concentrations of subsurface stone unless care was taken in all construction phases. These soils are located from MP 121.9 to 131.9.

Construction activities on the remaining 162 acres would involve disturbances to moderately deep soils on the steep to very steep slopes of the Wasatch Front Range canyon and plateau areas. These soils are susceptible to high and very high erosion hazards. Surface runoff is rapid. Disturbed site rehabilitation potential is fair. Sidehill cuts and fills associated with pipeline construction would require the immediate application of revegetation and rehabilitation measures in order to minimize loss of topsoil, sediment yield, and gully erosion. These soils are located from MP 138.9 to 148.9 and MP 149.9 to 160.0.

Soil Group 27

There would be 7 acres of Soil Group 27 disturbed by construction activities. These are shallow stony soils located on gentle to moderately steep slopes and subject to high erosion hazards. Surface runoff is slow and rehabilitation potential is fair. Due to the presence of planned and existing municipal facilities within and adjacent to these acres (Salt Lake City area), pipeline construction activities would be limited to defined locations and rehabilitation and revegetation measures would be promptly enforced. These soils are located between MP 148.9 and 149.9.

Soil Group 51

Construction activities would disturb 296 acres of Soil Group 51. These deep sandy soils are located on flat to gentling rolling terrain. The soils have a low erosion hazard and a good rehabilitation potential. Existing land uses associated with agriculture indicate that with proper and timely rehabilitation, impacts to soils would be minimal. These soils occur from MP 42.0 to 51.4 and MP 63.4 to 90.4.

Soil Group 55

Construction of this alternative would disturb 60 acres of shallow clay soils on gentle to steep mesa escarpments and rough broken land. The baseline condition of these areas is sparse; vegetation consists mainly of shrubs and forbs. Reseeding is difficult and generally not successful. A high wind erosion hazard is evident and fugitive dust would result from construction activities. Intensive application of rehabilitation measures would be needed to reduce accelerated erosion and prevent rills and gullying along the steep

slopes. Such erosion and its evidence is accelerated by short, intense rain storms characteristic of this climate. These soils are located from MP 33.9 to 42.0.

Soil Group 63

There would be 347 acres of Soil Group 63 disturbed by construction activities. More acres of this soil group would be affected by pipeline construction than any other group. The soils are shallow to deep sandy loams located mostly on gently sloping terrain. As with Soil Group 55, vegetative cover is sparce and past reseeding efforts have been mostly unsuccessful. The soils have a moderate erosion hazard; surface runoff is slow. Construction activities would disturb the desert pavement surfaces and a persistent reclamation effort would be required to attain preconstruction conditions.

3.6 WILDLIFE

Habitat (Refer also to Vegetation Section)

The most evident impact from the construction of the pipeline would be the clearing of wildlife habitat (vegetation) from the right-of-way and the addition of various ancillary facility sites. Possibly the most damaging impact to wildlife, however, would be that associated with human presence and activities around the construction sites during and after construction (the latter depending on public access into new areas).

Construction roads would provide access into formerly inaccessible areas leading to adverse impacts to all species. These impacts include loss of animals due to poaching, harassment, and forcing animals away from favorable habitats to less favorable areas resulting in lowered productivity.

Most construction impacts would occur on a narrow, linear impact area; therefore, the amount of impact could be very small relative to any one area. The pipeline right-of-way width would average about 60 feet; an average of about 7.3 acres per mile of line would be disturbed. The habitat that would be disturbed within this corridor represents only a fraction of 1 percent of each of the broad habitat types discussed in Chapter 2, Vegetation (BLM 1982).

Depending upon the habitat type which would be traversed, the desired land use, and the prescribed post-construction treatment, offsetting benefits may be realized in some areas. Depending on the product and temperatures throughout the pipe and the factors mentioned above, certain wildlife benefits may be realized in the area directly over the pipeline. The pipeline could provide snowmelt and retention of an open corridor free of snow during the winter months. Some existing pipelines have provided a greenhouse effect where soil moisture and temperature have combined to maintain areas free from snow and provide early plant growth which would benefit certain wildlife species.

Impacts to animals, birds, reptiles, and amphibians would include harassment, short- and long-term destruction of vegetation used for food and cover, temporary blockage of migration routes, and increases in illegal or wanton killing.

Terrestrial Wildlife

Mammals

Management of big game winter ranges and the species associated with them has several important aspects that should be considered when assessing impacts. Bioenergetics should be considered in the management of ruminant species (such as mule deer, pronghorn, American elk, and moose) on their winter ranges. In order to live, these animals must ingest and use energy and nutrients (Geist 1974). Unfortunately, energy and nutrients are usually hard to acquire and are easily depleted, since energy is used for maintenance of the animal with an efficiency rating of only 20 to 25 percent. The remaining nutrients are lost as heat (Geist 1974). Any movement or work except standing or resting imposes a high energy expenditure on the animal. Even mild alarm or excitement will increase the energy expenditure by 20 to 100 percent over that needed for standing; running and climbing can increase the energy expenditure from 300 to 1,500 percent or more (Graham 1962; Webster and Blaxter 1966; Kleiber 1961; Brody 1964). Since it is known that ruminants are greatly limited in their energy uptake (Drozda and Osiecki 1973; Graham 1965) they may actually eat less and therefore consume less energy than is required for maintenance. In these cases, the animals cannot afford to be harassed or chased while they are on winter ranges (Geist 1974). If the animals' energy expenditure increases due to harassment, regardless of range condition, their reproductive output would decline, along with their general state of health and growth rates (Geist 1974). Thus, management of ruminant game species on winter ranges must include consideration of energy expenditure when examining range condition or food supplies. A weight loss of 17 percent in pregnant reindeer leads to resorption of the embryo (Preobrazhenskii 1961) and the same likely would apply to other species. If energy expenditure for maintenance is increased due to harassment on winter range, it would be at the expense of the growing fetus, the young's milk supply, or even the longevity or survival of adult animals.

The magnitude of these effects cannot be reliably estimated. However, they could result in significant reductions in numbers of young-of-the-year. These effects could be expected to occur to all species of ruminants wintering in areas which would be traversed by this route.

Since the pipeline route would pass through these winter ranges, it is anticipated that these same impacts would occur to mule deer, American elk, moose, and pronghorn if pipeline construction was scheduled in any big game winter range areas during the critical December through March period. While these impacts could result because of construction activities, the operation, maintenance, and abandonment of the project is not anticipated to have any adverse impacts to these animals if constructed according to appropriate schedules and mitigation measures. Of major concern would be public access to the pipeline corridor, staging areas, pumping stations, and access roads by four wheel drive vehicles and the general public. Unauthorized activities would have to be restricted and monitored in previously isolated wildlife areas.

Secondary impacts which would be caused by project construction include poaching by construction workers, increased numbers of wildlife/auto accidents, and additional loss of habitat due to increased artificially-caused wildfires.

Wild and Free Roaming Horses

Wild and free roaming horse may occasionally wander through the alternative corridor area. Since they are not dependent on this area for survival no impacts are anticipated.

Birds

Construction of the pipeline would affect ground nesting bird species by direct destruction of nests. For important game species, this could result in a considerable reduction in production. For example, while pheasants average 15 or more eggs in their first clutch, renesting usually produces an average of about 8 eggs (Edminster 1954); sage grouse seldom renest unless the nest is destroyed prior to the onset of incubation. This could be applied to any small bird species that nest on the ground or in vegetation that would be removed along the pipeline right-of-way.

In addition to direct destruction of nests, other breeding factors could be disturbed by pipeline construction. In particular, sage grouse strutting grounds could be directly affected by pipelines traversing them, or indirectly by construction personnel harassing strutting males. A significant loss in total production could result from these actions. Disturbances to strutting sage grouse and to grouse areas during the critical mid-March through mid-June breeding and brooding period may affect reproduction by lowering reproductive success (Rogers 1964).

Small bird production could be totally lost when vegetation is cleared for the construction right-of-way. However, since production of these small birds is high and the total population turnover is quite rapid, population losses over the long term would be insignificant and probably unnoticeable over the short term.

Raptors

All raptorial birds are afforded protection under the Migratory Bird Treaty Act of 1936, as amended. Destruction of nests and harassment of nesting raptors is not allowed under this act. Population levels of many species of raptors are low and any reduction in production could significantly affect population levels. Protection for these birds is necessary for raptors to maintain current population levels.

If pipeline construction activities are scheduled in areas within a 1-mile radius of active raptor nests during the nesting period, possible abandonment of the nest could occur resulting in lowered production for that year. This lowered production is not anticipated to be significant over either the short or long term.

There are cliff and tree nesting sites for golden eagles along the proposed route. Since the golden eagle is afforded protection by the Bald Eagle Protection Act, destruction of nests or disturbance of nesting eagles would not be allowed because it could result in abandonment of the nest with a resultant loss in production. If construction were scheduled near a nesting

site during the early spring, a special permit would have to be obtained from the U.S. Fish and Wildlife Service prior to construction. Evidence of the existence of eagle nests would have to be determined by on-site surveys conducted during the active nesting season. Specific areas of concern are identified on the resource profiles (Figures 4 through 10, Chapter 2) and specific protective measures are addressed in Chapter 4.

Reptiles and Amphibians

Direct long term losses of reptiles for the life of the project and short term losses or temporary displacement (5 to 15 years) would represent less than 1 percent of the regional population. Reproduction of these species is high and populations would recover once reclamation is completed (BLM 1982). The small amount of riparian habitat occurring along the alternative corridor would temporarily limit amphibian populations.

Aquatic Wildlife

The primary impacts to the aquatic environment by pipeline construction would be direct disturbance to the streambed and to surface water quality by trenching operations, erosion caused by surface soil disturbance, and alteration of presently existing drainage systems. Trenching across a flowing stream by pipeline construction would remove and/or bury any bottom dwelling organism in the immediate vicinity of the crossing and could disrupt fish spawning areas. The actual area which would be disturbed by trenching is small (with a 100-foot wide construction zone at crossings there could be a temporary loss of 111 square yards of benthic substrate for each 10 feet of stream crossed); however, it would be very unusual if a 100-foot wide area was directly disturbed in a stream bottom. In addition, construction activities in streambeds would be short term. Bottom dwelling or benthic organisms normally would repopulate the disturbed areas rapidly and only a small fraction of the total available spawning habitat would likely be directly affected by trenching operations. Construction and revegetation techniques as well as the actual construction schedule should be considered.

Effects to stream crossings from construction are discussed generally in this section. Specific stream crossings or aquatic species are considered only when they require individual treatment in order to adequately assess potential impacts. Although there are differences in the aquatic life in each affected stream or river the nature of the various impacts is estimated to be similar for all species. It is expected that the anticipated impacts would vary depending upon specific construction techniques utilized to cross a stream or river, the characteristic of the stream, and whether the stream organisms are present in high or low numbers. Data are not available for the majority of streams which would be crossed; therefore, some assumptions are made regarding bottom dwelling organisms, their density, and their productivity.

Construction of the alternative would affect stream sedimentation, nonpoint source pollution, fuel spill hazards, and stream habitat alteration (Rogozen, et al. 1977 and Anderson, et al. 1978). No significant impact to aquatic resources would occur in riverbeds where water is not present during the construction period. For this reason, emphasis is placed on permanent streams and rivers which could maintain aquatic communities.

No significant long-term impacts to aquatic organisms would occur from non-point source pollution, fuel spills, and alteration of flows during construction. The short term required for stream crossing construction would not cause pollutants to concentrate at these construction sites. In addition, stream flows have to be maintained at all crossing locations and heavy equipment would be required to refuel away from stream channels.

Impacts to fish - Increases in stream turbidity and habitat disturbance or destruction would cause direct impact to fisheries. It has been found that an increased turbidity can affect productivity throughout all trophic levels (Karr and Schlosser 1978; Stern and Stickle 1978; Peters 1967). Under laboratory conditions, sustained exposure to high levels of suspended solids caused mortality to adult and juvenile fish (Herbert and Merkens, 1961; Herbert and Richards 1963). However, it has also been shown that fish do not remain in areas of high turbidity under natural conditions (Peters 1967; Herbert, et al. 1961). High turbidity levels would probably only last for a few hours after completion of construction and would therefore affect only a small section of a river or stream.

Fish which would be affected by increased turbidity would likely immigrate from the area temporarily (Gammon 1970). These fish are expected to return to the construction area shortly after turbidity levels return to normal. It is anticipated, therefore, that these impacts would be localized and short term.

The most important impact to fisheries that would occur from construction-induced turbidity, would be a potential reduction in the reproductive success of the fish. Fine sediment would settle on coarse substrates that are used for spawning, and the permeability of those substrates would be decreased. When fish eggs are deposited in these affected areas, water may not flow over the eggs and a decrease in hatchability would occur (Meehan and Swanston 1974; Auld and Schubel 1978). Sedimentation could also disrupt reproduction by covering spawning grounds making them unavailable for reproduction (Karr and Schlosser 1978).

It is anticipated that there would be no significant, long-term impacts to resident fish populations if stream crossing construction were scheduled outside periods of crucial fish migration and spawning activities. If, however, construction activities took place during the critical periods and in the vicinity of these critical areas, it is likely that egg and larval mortality would occur, even though limited to a relatively small area.

Impacts to Bottom-Dwelling Organisms - The primary impact of stream siltation on aquatic invertebrates would be gill membrane abrasion, smothering, and loss of acceptable habitat as a result of silt deposition. It has also been reported by Cordone and Kelley (1961) that siltation for about 0.25 mile downstream from a dredging operation, eliminated macroinvertebrates (bottom dwelling organisms). For example, there was a 50 percent reduction in total population 1 mile below the dredge. Not only do bottom-dwelling organism populations decrease when sedimentation increases (Tebo 1955), but low levels of sedimentation could also alter species composition (Conlan and Ellis 1979; Rosenberg and Wiens 1978). However, impacts caused by pipeline construction

would be considerably less damaging than impacts caused by a dredging operation because of the duration and magnitude of the separate operations.

Regardless of the time of year construction would occur in a stream crossing, it is anticipated that no significant, long-term impacts would occur. Recovery could be expected within 3 to 6 months after completion of construction because of organisms drifting downstream to the impact area and immigration from adjacent areas. No secondary impacts to fish populations are anticipated since the fish will likely feed in unaffected areas or on other available invertebrates within the impact area. Because of the anticipated rapid reinvasion of macroinvertebrates, impacts would be of minor significance and of short duration (Gore and Johnson 1979).

In most cases, seasonal restrictions on construction activities would substantially minimize impacts to aquatic organisms. However, the removal of vegetation along stream banks could cause a significant impact. Impacts could be long term on these small areas if revegetation techniques do not reestablish adequate cover and bank protection within a short time.

The Utah Division of Wildlife Resources anticipates that there would be no significant impacts to aquatic resources at any of the stream crossings as long as management practices, as defined in Title 33 CFR, 1980 ed., part 323, are followed (BLM 1981a). A summary of major stream crossings and their habitat value classes are shown in Table 7.

Threatened or Endangered Species

Mammals

No federally listed endangered or threatened mammal species are known to inhabit the alternative corridor area. However, since there are whitetail prairie dog colonies in the area, an inventory of these colonies should be undertaken and any colony directly affected by alternative pipeline activities should be surveyed for signs of black-footed ferrets.

Black-footed Ferret - The alternative pipeline corridor may pass through a part of the historical range of the black-footed ferret. The route may also pass through prairie dog colonies which are the ferret's natural habitat. Any prairie dog colony could provide suitable habitat for the black-footed ferret, but several colonies, including some large ones in proximity and with a stable prairie dog population, appear to be necessary for the maintenance of a ferret population (F&WS 1978; Colorado Division of Wildlife 1978; Queal, et al. 1977). The disturbance associated with pipeline construction could result, at least temporarily, in the loss of portions of some prairie dog colonies.

It is not anticipated that a black-fooed ferret would be present within any prairie dog colony which would be disturbed by construction. Therefore, any prairie dog colony which would be traversed by the pipeline may affect the black-footed ferret unless field surveys determine otherwise. The species would not be affected by the operation, maintenance, and abandonment of the project.

Birds

Bald Eagle - No known bald eagle concentration areas would occur within the alternative pipeline corridor; however, at least one wintering area is known around Pelican Lake which is approximately 2 miles north of the alternative study corridor between the Green and Duchesne rivers. Particular care would be needed to leave all large trees between MP 40 and 50, particularly along water courses and riparian areas. If large roost trees were destroyed by the pipeline traversing this general area, the project could indirectly affect the wintering population of eagles (Sprunt 1972). If pipeline construction would occur before bald eagles have migrated to winter habitat, construction would not directly affect the birds. The bald eagle would not be affected by operation, maintenance, and abandonment of the project.

Whooping Crane - Whooping cranes may rarely occur as transients in the areas that would be crossed by the alternative. Except in an unusual circumstance, whooping cranes would not be affected by construction, operation, maintenance, or abandonment of this alternative pipeline route.

American Peregrine Falcon - While peregrine falcons may occasionally be observed along the alternative study corridor, the temporary construction of the pipeline is not expected to adversely affect this species.

Fishes

Because construction activities at stream crossings would be of short duration and the amount of acres disturbed small (250 feet by 450 each at each crossing on an average), no adverse impacts to endangered and threatened or rare species is anticipated in the Lower Duchesne and/or the Green rivers. The Colorado squawfish, humpback chub, bonytail chub, and the razorback sucker are adapted to high fluctuations in turbidity and suspended sediment. The construction and operation of the alternative would not likely adversely affect these species if appropriate mitigation measures as described in Chapter 4 are followed.

3.7 AGRICULTURE

The main concerns related to construction, operation, and maintenance of the Salt Lake City Alternative Product Pipeline on agricultural lands include: (1) irrevocable commitment of prime and unique farmlands or farmlands of statewide importance to non-farmland uses (2) loss of crop production during the construction year (3) restoration of crop production (4) reduction of grazing until areas are restored (5) accelerated soil erosion (6) disturbance of topsoil and soil compaction (7) disturbance to irrigation systems during irrigation season (8) disturbances of subsurface drainage systems and (9) long term land use changes at the one surface facility site. (Acreages of agricultural land temporarily or permanently affected by construction, operation, and maintenance of the alternative are presented in Chapter 2).

Cropland

Because of the nature of the pipeline project, permanent or long term changes in agricultural land use would be minimal. Land disturbance would be locally significant during the construction period but most of the agricultural land would be restored to its preconstruction condition except for land use changes at the one surface facility site (pump station #3, MP 88). Timely and successful revegetation is needed for successful restoration of cropland and other disturbed areas along the pipeline route.

The long-range production potential of the prime and unique farmlands and farmlands of statewide importance in the Duchesne River Valley area would be retained; there would be no irrevocable commitment of these lands to non-farmland uses. Timely and successful revegetation measures would return these lands to their preconstruction potential within 1 to 2 years after initial construction activities were initiated.

Irrigation water delivery systems would be disrupted as a result of pipeline construction. Chapter 1 of this report discusses Tosco's commitment to apply mitigation measures (agreeable to landowners) for the protection and uninterrupted operation of irrigation water delivery systems. The applicant's construction schedule indicates pipeline construction would take place from April through October, which is the seeding and harvest season for most crops grown in the area. The applicant has indicated that crop losses and other damage will be compensated individually. With appropriate timing of construction to avoid crucial irrigation periods, this impact would be minimized and become generally insignificant.

Agriculture would be significantly affected from land use changes where surface facilities, such as the pump station at MP 88, maintenance bases, and access roads on cropland and grazing land would change agricultural land use to industrial use for the life of the project (35 years). Impact to potential crop production for the life of the project would be considered significant where cropland areas of 2 acres or larger would be required for surface facility sites. Where surface facility sites are located on native range areas used for grazing, impacts would be considered insignificant.

Livestock Grazing and Cropland Production

The main concerns related to construction, operation, and maintenance of project activities on grazing lands include: (1) disruption of trailing patterns of livestock to and from water in areas where construction occurs between grazing areas and water sources; (2) hazards because of open trenches in small pastures or near traditional cattle or sheep trails; (3) difficulty in restorating the pipeline right-of-way if livestock used the cleared area as a trail; (4) diverting sheep trailing or authorized trails due to construction activities; and (5) invasion of noxious weeds caused by clearing activities.

Initial loss of forage to livestock users would vary from approximately 1 to 17 AUM's per mile of construction or more within the 60-foot wide right-of-way.

The impacts to cropland production and livestock grazing in the Duchesne River Valley area would be minimized and of short duration if rehabilitation measures were coordinated with irrigation periods and methods. Reduction or losses to crop production would last from 1 to 2 years and grazing reductions from 2 to 5 years.

Impacts to total cropland production and livestock grazing in the Kamas Valley and Parley's Park areas would be considered minor and temporary with a successful reclamation program. Reductions or losses to crop production would last for 1 year and grazing reductions from 1 to 5 years. In portions of the Kamas Valley area, these reductions would last longer if construction techniques and reclamation activities were not designed to protect the shallow soil profiles.

The Uintah and Ouray Indian Reservation grazing lands and BLM administered lands would be difficult to revegetate. These lands would experience reduced vegetation density, invasion of undesirable plants and accelerated soil erosion. One to two AUM's (per mile) would be lost until the right-of-way was successfully rehabilitated.

Based on impacts resulting from the Chevron Oil pipeline construction, a large percentage of the vegetation would not be restored on National Forest grazing lands (Daniels 1982). The existing pipeline right-of-way AUM loss is set at 192. Although the loss of forage on the pipeline right-of-way was partially recovered in some areas, the majority of the right-of-way grazing forage has not recovered. The existing Chevron right-of-way is being used as a travel corridor by livestock, wildlife, and off-road vehicle users. An increase in this use is causing a reduction of the expected AUM's along the right-of-way. The disturbance along the Chevron right-of-way does not allow for plant stabilization due to continual trampling and grazing of the plants. Also, the stabilization of the soils along the existing right-of-way cannot be achieved due to vehicles continuing to disturb the soil and compaction of the soils from both animal and vehicle travel (Daniels 1982). In addition, the soils within the right-of-way are subject to poor slope stability and high erosion hazards. These stability and hazard problems would cause revegetation difficulties, and intensive rehabilitation measures would be required. (Soil stability and erosion problems are still evident along the Chevron Oil pipeline right-of-way particularly from MP 95 to 108.)

The rangelands between Kamas Valley and Parley's Park would experience short-term reductions in available forage (1 to 5 years). A longer reduction period would result if construction techniques and reclamation activities were not designed to protect the shallow soil profiles. An estimated 10 AUM's would be lost until the right-of-way in this area was successfully rehabilitated.

Refer to Table 19 for display of loss of grazing use from rangeland with available forage and value of grazing losses.

Table 19 [e]

Loss of Grazing Use from Pipeline Construction

Private[a] (Including Indian			Forest Service			Indian (Reservation Land)			Bureau of Land Management			Totals		
Acres[b]	AUM's[c]	$[d]	Acres	AUM's	$	Acres	AUM's	$	Acres	AUM's	$	Acres	AUM's	$
389	64	538	102	232	536 2,359	77	2	17	11	1	9	579	299	1,100 2,359

Source: USDA, Forest Service, Fishlake National Forest, Garth Heaton - Forester, 1982.

a Private and Indian allotted grazing lands include irrigated and nonirrigated pasture land within agriculture areas.

b Acres reflects land area within the 60-foot right-of-way.

c AUM is defined as the amount of forage necessary to sustain one animal unit for one month: Totals from USFS and BLM sources.

d Value is computed as fees charged times AUM's.

- FS values expressed as revenue loss to Government ($2.31/AUM) i.e., $536; and economic value per AUM lost to a permittee, due to exclusion from FS Grazing Allotments ($10.17/AUM), i.e., $2,359 economic value loss to permittees.

- Private and Indian allotted value - $8.40.

e Initial forage disturbance and resulting losses for one grazing season--would carry over to succeeding grazing seasons until successfully revegetated.

3.8 TRANSPORTATION NETWORKS

Transportation impacts are judged to be significant if the traffic on a roadway is at a level where a further increase in traffic would cause a reduction in the level of service, such as instability of traffic flow, noticeable congestion, or a substantial (more than 30 minutes) increase in the average travel time. This would most likely occur in areas that receive heavy use. Other consequences would possibly include damage to surfaces resulting from use of heavy equipment and/or excessive traffic volume.

Impacts on the existing roads could result from activities during construction of the alternative. These impacts are of three primary types:

1. Increased traffic caused from workers traveling to and from construction work sites.

2. Increased movement of heavy equipment and materials to the construction site.

3. Disruption of roads while the pipe is placed under existing roads.

Each of these impacts could cause traffic delays and some could result in accelerated deterioration of the existing roads.

Traffic delays due to pipeline construction at road crossings would likely last between 5 and 30 minutes, and in most cases, would be considered insignificant because the traffic delays would be of short duration and would not likely cause changes in traffic flow patterns.

The operation and maintenance of all alternative project components would not be expected to cause impacts on existing roadways. Because of the proposed construction method there would be no expected impacts on the railroad rights-of-way, other pipeline systems, or transmission systems. Each crossing would be approved by the respective owner and there would be an agreement on the timing of pipeline construction activity to assure no disruption in service.

It was determined (see Appendix L) that a total of 716 truckloads of pipe would be hauled to build the pipeline. It is believed the pipe would be hauled from Provo, Utah, since that is the closest location for the manufacture of steel pipe. Figure 12 shows the number of truckloads of pipe to be hauled over each of the highways between Provo and the pipeline route.

The tables in Appendix M show the average monthly and daily percent use figures for Highways 189 and 40 for the year 1979 (BLM and FERC 1981). The impact of hauling the pipe is believed to be insignificant with regard to an increase in traffic. It can be seen from the figures of Appendix M that even if all the pipe were to be hauled for the entire line on a single weekday, Monday through Thursday, there would not be as much traffic on the road as would be expected on a weekend. Of course, the pipe would be hauled over a period of weeks or months instead of a single day.

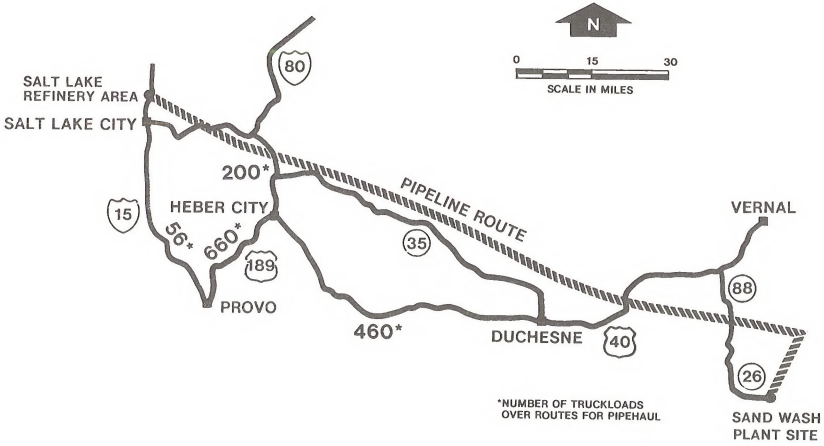


FIGURE 12

SCHEMATIC OF PIPELINE ROUTE AND HIGHWAYS

The hauling of equipment to the construction area would present an even lesser impact than the hauling of pipe. It is estimated that 10 to 12 heavy equipment vehicles would be required at each spread (see Figure 2). This equipment would be hauled to and from the pipeline route only once. This would require a total of about 60 truckloads for equipment hauling if the contractor utilized three simultaneous spreads as has been indicated.

It is estimated that about 30 people would be working at each spread. This implies that at most an additional 180 trips per day (90 people at 2 trips each day) would be expected as a result of pipeline construction work. Although it is difficult to estimate these quantities (the exact number of workers and their living accommodations are unknown), it is anticipated that the travel of workers to and from the construction sites would have the most impact on traffic. This impact would probably not be significant, but if work takes place on the weekends, the added traffic would add to already heavily traveled routes.

The towns of Duchesne and Heber City would experience an increase in the amount of traffic which passes through on Highways 40 and 40/189, respectively.

Degradation of the road surfaces due to the hauling of the pipe (over 700-40 ton loads) is not a significant concern (Todd 1982). The expected 40-ton loads on an 18 wheel truck would not exceed the 18,000 pound legal maximum axle load and would not present a problem. The 700 anticipated trips would be insignificant in view of the roads' 20-year design.

It is likely that pipe haul and construction traffic (from the community of Myton, Utah, to the plant site) would take place over Utah State Highway 88 and BIA/Uintah County Highway 26. These highways are presently in poor condition as a result of on-going movement of oil field equipment and sand-gravel transporting. The one lane bridge at Randlett on Highway 88 adds to the problem of safe and even flow of traffic along the road. The communities of Myton, Fort Duchesne, Randlett, and Ouray would experience an increase in the amount of traffic which passes through them on these roads; traffic safety concerns and road maintenance problems would increase.

If existing scheduled maintenance is presently meeting the objectives of providing safe travel protecting the transportation facility from irreversible deterioration, it does not appear that any significant adverse impacts would result to roadways, railroads, pipelines, underground cables, or power transmission lines from construction of the alternative pipeline. In the case of Utah State Highway 88 and BIA/Uintah County Highway 26 (and roads with similar road use conditions), increased traffic from the pipeline project could cause adverse impacts, when added to those impacts and conditions already occurring.

3.9 RECREATION

Water-Oriented Recreation Opportunities

The alternative pipeline crossings of the White and Green Rivers, both previously noted as having nationally significant characteristics as potential candidates for National Wild and Scenic River status, would not significantly affect the "natural, cultural, or recreation values" of these rivers. Tosco would use either cofferdams or boring procedures during low flow conditions to minimize environmental impacts (Tosco 1982b). Therefore, no impacts to river runners (canoeists and rafters) or fishermen would result since these activities primarily occur during high flow periods. Additionally, since the impacts of noise, dust, and construction equipment would be temporary (4 to 8 weeks) and based on either the use of cofferdams or boring, both the White and Green rivers would have their national significance as potential candidates for National Wild and Scenic Rivers unimpaired.

The project related impacts to Pelican Lake, Bottle Hollow Reservoir, and Starvation Reservoir would be from increased fishing and use of campground facilities. These increases would be expected to be minimal and of short duration (1 to 4 weeks).

The crossings of the Duchesne River, Provo River, and Wolf Creek would cause minimal impacts (Tosco 1982b). However, due to the noted fishing (particularly fly fishing opportunities) along the Duchesne and Provo rivers, some temporary, short-term (4 to 8 weeks) noise, dust, and visible construction equipment impacts would diminish the quality of fishing along the affected segments of these rivers. Access to many summer homes along the Provo River in Kamas Valley could also be temporarily disrupted due to pipeline construction-related activities.

The proposed Little Dell Reservoir dam site which has been authorized by Congress for construction by the U.S. Army Corps of Engineers, would conflict with the existing Chevron oil pipelines, Mountain Fuel Company gas pipelines, and the alternative pipeline right-of-way. Both the Chevron oil pipelines, Mountain Fuel gas pipelines, and Tosco's alternative pipeline would have to be relocated so as not to conflict with the proposed dam site. Once the new reservoir would be created, new outdoor water-oriented recreation opportunities would become available for both the pipeline construction work force and the people of the region which would result in positive recreation benefits for the public.

Land-Oriented Recreation Opportunities

The construction of the alternative would create some temporary, short-term (4 to 8 weeks) impacts upon the quality of the sightseeing experience at the Devil's Rock House due to noise and visual intrusions from construction equipment and vehicles.

Should the alternative product pipeline be constructed during deer or waterfowl hunting seasons on the Ouray National Wildlife Refuge, hunting quality could be temporarily diminished. The sights and sounds of construction activity not only would disrupt wildlife, but would also affect hunting

quality for those hunters seeking primitive or semi-primitive experiences. Bird watchers, nature study, and sightseeing enthusiasts would also find, on a temporary basis, pipeline construction equipment, dust generated by construction vehicles, and noise incompatible with what would be expected to be found on a National Wildlife Refuge. However, these impacts would be of short duration (4 to 8 weeks).

No adverse or long-term impacts upon campers would be anticipated at the Bottle Hollow Resort or Starvation Reservoir; use of these areas by pipeline construction work force would be expected to be on a weekend basis over a period of one month or less.

Since the Dominguez-Escalante Trail parallels U.S. Highway 40 with its associated traffic volumes, construction and placement of the alternative product pipeline would have no impacts upon hiking experiences.

The use of off-road vehicles (ORV) for access into the Uintah Ouray Indian Reservation is of major concern to the Ute Indian Tribe. Construction of another pipeline paralleling the existing Chevron pipelines would likely cause the proliferation and unauthorized ORV use on Ute Tribal land. Certain cases of ORVers harassing wildlife, poaching, unauthorized firewood collection, trespass, and camping and fishing on Tribal property without appropriate permits have occurred in the past and could likely create increased management problems in controlling unauthorized recreational uses for Ute Tribal officials.

The crossing of both the Uinta and Wasatch National Forests would create environmental problems stemming from the unauthorized use of ORV's for access into these National Forests. The disturbance of the land and potential for widening the existing permanent right-of-way would eventually encourage increased ORV use along the alternative pipeline route. This access problem would disturb wildlife, vegetation, and result in soil losses which would conflict with and diminish the quality of nonconsumptive forms of recreation such as hiking and backpacking.

Camping experiences at the Wolf Creek campground within the Uinta National Forest would receive temporary, short-term impacts (4 to 8 weeks) because the campground is within the study corridor, therefore, causing construction-related noise, dust disruptions, and visual intrusions upon campers. Additionally, main access into the campground along Highway 35 could temporarily be affected by heavy and slow moving pipeline construction-related vehicles and trucks since the pipeline would cross the highway four times from Woodland to Tabiona.

Pipeline construction activity through Emigration Canyon during the summer months when sightseeing and hiking along the Mormon Pioneer National Historic Trail are at its peak use would diminish the quality of sightseeing and hiking experiences. The sights and sounds of pipeline construction activity, generated dust, and heavy, slow-moving construction equipment, would impair temporarily (4 to 8 weeks) the visual quality of the canyon and therefore, affect sightseeing and hiking expectations.

3.10 WILDERNESS

There would be no impacts to existing or potential wilderness areas.

3.11 CULTURAL RESOURCES

The magnitude of impact on cultural resources cannot be absolutely determined until an alignment is chosen and a centerline is staked and examined in detail for cultural resources which presently may be undetected. Adverse impacts to cultural resources could occur during ground disturbing activities associated with construction of the pipeline. Construction could also damage, or destroy cultural resources which could result in the loss of: specific scientific and cultural information, physical representation of the resource, a portion of the resource base for future research, and artifact materials. Wherever possible and feasible, known and newly found cultural resources would be avoided by construction related activities. If this is not possible, the appropriate regulatory agency would consult with the appropriate State Historic Preservation Officer to determine the most satisfactory means of mitigation. Even with present salvage techniques, some scientific and educational information could be lost. Construction and maintenance activities associated with the alternative pipeline could inadvertently damage or destroy cultural resources either through accidental damage and/or increased vandalism.

Three historic site monuments (markers), 1 state park, and 1 military reservation (Table 12) and 16 other known archeological and/or historic sites (Table 11) would also require avoidance, protection, or mitigation. Four National and/or 6 State Register properties are listed as being located either within or near the mile-wide corridor. One additional site, the Pioneer Limekiln site, is currently being nominated for the National and State Register (Table 13). All of these properties would need avoidance, protection, and/or special consideration during pipeline construction and operation activities.

3.12 VISUAL RESOURCES

The alternative pipeline would affect visual resources throughout portions of the entire 160-mile length during the actual construction process; however, some areas would be more significantly affected than others. This significance would depend on the degree to which certain portions of the corridor would be seen; the existing quality (class) of the scenery; the amount of change (contrast) in scenic values; and the potential for rehabilitation (duration).

All of these factors were analyzed in order to determine the significant impact areas (see Appendix N). Five segments of the corridor would experience long-term visual impacts. Four of the segments occur on the Uinta National Forest from Wolf Creek (MP 95) to and along the Upper Provo River to Woodland (MP 115) where the existing Forest Service visual absorption capacility (VAC) objectives would not be achieved. The fifth segment occurs at the top of Parley's Summit (MP 137.0 to MP 137.6) where tree removal would create a long-term noticeable visual change in direct view from Interstate 80.

Numerous other segments of the pipeline corridor (especially between MP 127 to 154) have high visual sensitivity; however, these segments would be expected to involve short-term impacts (1 to 5 years) and high potential for rehabilitation as mitigation measures for land reshaping and revegetation occur. The overall adverse impact would be insignificant.

3.13 GEOLOGY AND PALEONTOLOGY

The only relationship of the pipeline to seismic risk is one of potential damage to the pipeline from earthquake and potential secondary impacts to on and off site resources from petroleum spills. Twelve fault crossings would be made in areas of moderate to major risk with risk of one movement in 50 years at two faults near Salt Lake City. Should the pipeline fracture at a fault near the University of Utah, visual impacts and some damage to buildings could be expected. The pipeline would be susceptible to breakage which could lead to secondary impacts on soils, vegetation, animal life, and surface water along 15.5 miles in the areas of mass movement (see Appendix A, Oil Pipeline Rupture and Spill Analysis). Construction of the pipeline in these areas would disturb the already unstable soils and increase the instability of the slopes. Construction within the 15.5 miles of oil and gas producing areas would not result in impacts to oil and gas production, but the existence of pipelines and facilities in these areas would make construction of the alternative pipeline difficult by making it necessary to use manual labor techniques to avoid existing structures.

The potential extent of damage to paleontological specimens and resultant loss of scientific information cannot be quantified but would be greatest in the 66.8 miles of pipeline that would cross formations with medium to high potential for paleontological significance (see Figures 4 through 10, profiles).

The pipeline would not likely conflict with potential future development of the .25 mile of phosphate deposit between MP 91 and 93 as it would cross only the southernmost edge of the deposit. The largest portion of the phosphate lies north of the alternative pipeline corridor.

3.14 EXISTING LAND USE PLANS, CONTROLS, AND CONFLICTS

Table 20 depicts those known land use plans, the locations along the pipeline route, and plan conflicts associated with a 1-mile wide study corridor for the alternative product pipeline proposal.

Table 20

EXISTING LAND USE PLANS, CONTROLS, AND CONFLICTS

	Plan	Location	Plan Conflict
1.	Rainbow Management Framework Plan (MFP) BLM, Vernal District		
	White River	MP 6.7	Conflict with MFP Plan.
	Green River	MP 20.4	Same as White River.
2.	Nationwide Rivers Inventory, Phase, formerly the Heritage Conservation and Recreation Service and currently the National Park Service		
	White River	MP 6.7	No conflict due to Tosco's plans to either bore under the river or use cofferdams which would not have permanent adverse impacts upon the "natural, cultural, or recreation" values of the river.
	Green River	MP 20.4	Same as White River.
3.	Ouray National Wildlife Refuge U.S. Fish and Wildlife Service	MP 18-21	No conflict would result if strict mitigating measures were applied to minimize environmental impacts to wildlife habitat.
4.	Uintah and Ouray Indian Reservation, Ute Indian Tribe	MP 21-27; MP 36-39 (grazing) MP 29-34 (water)	No conflict would result if strict mitigating measures were applied to minimize environmental impacts to grazing lands, the fishing on the Duchesne River, and the Leland Bench area for water development.
5.	Dominguez-Escalante Trail proposed National Historic Trail under the National Trail System Act	MP 48	No conflict would result if strict mitigating measures were applied to minimize environmental impacts to the trail and upon hiking experiences.

Table 20 (cont'd)

Plan	Location	Plan Conflict
6. Uinta National Forest Travel Plan	MP 95.4-108.9	Conflict since unauthorized off-road vehicles (ORV) would likely continue to pose a problem along the right-of-way.
7. Uinta National Forest, Heber Ranger District Multiple Use Plan, Forest Management Units	MP 95.9-97.4	No conflict if the Wolf Creek geological area, cliffs, is avoided.
	MP 95.9-97.4	No conflict with the oil pipeline.
	MP 100.4	No conflict if the potential recreation campground site is avoided.
	MP 100.4	No conflict if the turnout for panoramic view is avoided.
	MP 101	No conflict if the timber clearcut demonstration area is avoided.
	MP 104	No conflict if the slide area is avoided.
	MP 104	No conflict if the Japanese Pilot Historic Monument is avoided.
	MP 107	No conflict with Tosco's plans to either bore under the Provo River or use cofferdams to minimize environmental impacts
	MP 108	No conflict if the Nobletts Area, geological area is avoided.
8. Uinta National Forest Proposed Forest Management Plans and Draft Environmental Impact Statement	MP 85.4-108.9	No conflict, since the alternative pipeline would be within a proposed corridor.
9. Wasatch National Forest Travel Plan	MP 144-149	Conflict since unauthorized off-road vehicles (ORV) would likely continue to pose a problem along the right-of-way, especially with the potential of tripling new homes in the area (Emigration Canyon).
10. Wasatch-Cache National Forest Utility Corridor Evaluation (part of the proposed Forest Management Plan)	MP 144-149	No conflict should the recommended utility corridor guideline prohibiting off-road vehicles from the right-of-way be implemented, including on-the-ground enforcement of guideline.
11. Salt Lake County Planning and Zoning Ordinance	MP 138-157	Conflict. A variance to the Foothills Preservation Ordinance through portion of Emigration Canyon will be necessary. Strict mitigation will be needed.

Table 20 (cont'd)

Plan	Location	Plan Conflict
12. Mormon Pioneer National Historic Trail under the National Trail Systems Act	MP 142-149	No conflict would result if strict mitigating measures were applied to minimize environmental impacts to the trail and upon hiking experiences.
13. Emigration Canyon National Register of Historic Places	MP 142-149	No conflict would result if strict mitigating measures were applied to minimize environmental impacts to transportation flows, vegetation, soil erosion and slumpage, wildlife disturbance, visual quality, historical values etc.
14. Little Dell Reservoir proposed by the U.S. Army Corps of Engineers	MP 142	Conflict with the proposed dam site and the alternative pipeline right-of-way.
15. Salt Lake City Planning and Zoning Ordinance	MP 149-157	Conflict. A variance to the City Site Development Ordinance (Independent Site Development Activities) through portions of Emigration Canyon, and the foothills near the University of Utah and gravel pit areas will be necessary. Strict mitigation will be needed.
16. Salt Lake City Council potential annexation of Emigration Canyon	MP 142-149	Potential conflict with existing and proposed new home sites in Emigration Canyon. Avoidance of as many home sites as necessary to avoid conflict.
17. University of Utah - Master Plan for Facility Expansion (1981)	MP 151-152	Potential conflict with new buildings and parking area. Utilization of existing pipeline right-of-way will be necessary to minimize conflict with University proposed facility expansion.
18. Salt Lake City, Water Resources Board, City Creek Canyon	MP 153.6	Conflict. A variance to the Water Resources Board policy of prohibiting construction activity in the watershed of City Creek Canyon will be needed.

Source: Bureau of Land Management, Division of Environmental Impact Statements Services - Denver, Colorado, George Detsis - Environmental Specialist, 1982.

Chapter 4: SALT LAKE CITY ALTERNATIVE PRODUCT PIPELINE - MITIGATION MEASURES

The mitigation measures consist of two sections.

Under SECTION 1--The impact analysis assumes incorporation of the measures into the project work. The impact analysis also assumes incorporation of the Tosco's construction practices and design features listed on pages 8 through 12.

The measures are divided into Measures Required on Federal Lands or by Federal Agencies for Water and Wildlife Resources and Measures Required on Non-Federal Lands. Measures included under each of these subsections are listed by affected resources.

Under SECTION 2--The measures were developed as a result of impact analysis.

The measures are divided into Measures Required on Federal Lands or by Federal Agencies for Water and Wildlife Resources on Non-Federal Lands (site specific measures) and Uncommitted Measures Proposed by Local Governing Groups, Municipal Entities, and Private Landowners. As with Section 1, measures included under each of these subsections are listed by affected resources.

SECTION 1 (MEASURES INCORPORATED INTO IMPACT ANALYSIS)

A. Measures Required on Federal Lands, i.e., lands administered by the Bureau of Land Management (BLM) and Forest Service (F.S.); Measures Required by the U.S. Fish and Wildlife Service (FWS); and Measures Recommended and Required by the U.S. Army Corps of Engineers (COE).

1. Introduction to BLM and FS General Measures

Standard mitigation is established by existing law, policy, and regulation. Such mitigating measures are included here as general guidelines only and may be altered by the appropriate Federal Agency authorized officer to meet site-specific needs.

A construction, operation, and maintenance (COM) plan or similar document would be prepared covering the construction of all project facilities. This plan would contain the following sections on site specific provisions: (Because the alternative right-of-way is composed of many types of terrain, soils, vegetation, land uses, and climatic conditions, the sections within the COM plan would include sets of techniques and measures tailored to each condition encountered.)

- Fire Protection
- Clearing - Visual Resources
- Erosion Control, Revegetation, and Restoration. Specific guidelines for the Erosion Control, Revegetation, and Restoration Section of the COM plan are included in this report as Appendix J.
- Transportation
- Communication

- Cultural Resources
- T&E Studies and Mitigation (including a wildlife mitigation plan developed jointly by UDWR, BLM, USFS, and Tosco)
- Blasting
- Pesticide and Herbicide Use
- Health and Safety
  a. Solid Waste
  b. Emergency Response
  c. Air Quality
  d. Transportation
- Site Prescription
- Right-of-way Maintenance and Monitoring

Technical assistance and approval of written plans for Federal lands would be obtained from the BLM and the FS prior to any construction.

Under authority of Section 504 of FLPMA, the applicant would be required to provide funding to the appropriate Federal Agencies for the purpose of financing one or more specialists for administration of construction activities.

2. BLM and FS General Measures.

   a. Air Quality.

      1) The applicant would conduct all activities associated with the project in a manner that would avoid or minimize degradation of air, land, and water quality. In the construction, operation, maintenance, and abandonment of the project, the applicant would perform its activities in accordance with applicable air and water quality standards related facility siting standards, and related plans of implementation, including but not limited to, the Clean Air Act, as amended (42 USC 1321). (Also apply to Water and Soil resources mitigation).

   b. Water. In an attempt to reduce the amount of sediment which enters the streams or to reduce the impact of sediment which is disturbed within the streams, the applicant would follow the following guidelines.

      1) When crossing streams within the pipeline right-of-way, streams would be crossed only at the pipeline crossing.

      2) A buffer strip of terrestrial vegetation would be left between work areas adjacent to the stream and the stream itself. Riparian vegetation would not be counted upon as a buffer strip because silt collected by the riparian vegetation might enter the stream during high water periods.

      3) The applicant would time the construction of the stream crossings with low flows. The stream would have less capability for carrying sediment with less volume of water and slower velocities.

4) The applicant would complete the work as quickly as possible and return the stream to its natural state soon after the pipe is laid.

5) Backfill material for the pipe in the streambed would be of predominantly coarse material because the fines would be washed away during placement.

6) The banks of the streams would be returned, as nearly as possible, to their original condition.

7) Construction across streams by boring, driving, or trenching would be specified by the authorized officer on a case-by-case basis.

8) When providing temporary access to the pipeline right-of-way, all rivers, streams, and washes would be crossed at existing roads or bridges, except at locations designated by the authorized officer. The applicant would be required to install culverts or bridges at points where new permanent access roads would cross live streams to allow unobstructed fish passage. Where drainages would be crossed by temporary roads, dirt fills or culverts would be placed and removed upon completion of the project. Any construction activity in a perennial stream would be prohibited unless specifically allowed by the authorized officer. All stream channels and washes would be returned to their natural state. Such construction, when it would occur on National Forest land, would be managed under the restrictions in the FS and Department of Agriculture Policy Statement No. 2019, dated July 8, 1980. (Also applies to Wildlife resource mitigation).

9) Construction equipment would be refueled and maintained outside of stream channels in areas designated by the authorized officer.

c. Vegetation.

1) The applicant would be required to control noxious weeds in areas where soil surface had been modified or natural vegetation had beem removed. Noxious weeds would be controlled in areas designated by the authorized officer.

2) On areas which would be cleared of vegetation by construction or other activity associated with this project, vegetation would be re-established under the direction of the office in charge. Vegetation cleared during construction would be disposed of per authorizing agency direction. Where commercial tree species are cut, the trees would be cut, measured, and commercially sold per direction of the authorized officer.

3) Clearing in timbered areas to reduce fire hazard would be limited to the working space right-of-way.

4) The authorized officer would require preclearing of mountain brush and tree-covered areas prior to dozer or maintenance blade work. Preclearing will involve handwork in cutting of brush and trees with removal by proper equipment to designated areas.

5) The reestablishment of vegetative cover as well as watershed stabilization measures would have the requirement of completion during the ongoing working season and prior to the next winter season.

6) Trees and brush (indigenous species) would be established according to the revegetation and rehabilitation plan contained within the construction and operation plan.

7) Disturbed areas which in the opinion of the authorizing agency were unsuitable for successful revegetation would be protected under the provisions of an approved reclamation, erosion control, and revegetation plan. This plan would state the method of protection to be used and the provisions for prevention of site deterioration and introduction of noxious weeds. At a minimum, a reclamation, erosion control, and revegetation plan including such items described in Appendix J would be required for all federal land rights-of-way. This plan would be submitted to the authorizing agency for approval prior to disturbance.

d. Soils.

1) Existing soils and geological data would be gathered and used to achieve maximum revegetation and soil erosion mitigation responses.

2) Removal and stockpiling of topsoil would be required at all construction sites unless otherwise directed.

3) All topsoil would be conserved for reclamation requirements; excess topsoil would be stockpiled at designated locations.

4) Areas subject to mudflows, landslides, avalanches, rock falls and other types of mass movement would be avoided where practical in locating the linear facilities. Where such avoidance is not practical, the design, based upon detailed field investigations and analysis, would provide measures to prevent the occurrence of mass movements.

e. Wildlife

1) Under the terms of the Endangered Species Act of 1973, the applicants would be required to conduct surveys to determine if listed species or their habitats might be present on areas to be disturbed by any of the alternative regardless of land ownership. If it was determined that listed species or their habitats might be present and could be affected by the proposals, appropriate consultation with the U.S. Fish and Wildlife Service (FWS) would be conducted by the Federal authorizing agency. No activities would be authorized until consultation was complete as specified by Section 7(c) of the Act. The Biological Opinion issued by FWS as a result of the consultation process would specify the specific mitigation measures to be carried out by the applicant.

2) Any active golden eagle nest found within 1 mile of project activities would have to be protected from harassment during the critical nesting period because of provisions established by the Bald Eagle Protection Act that requires protection of the golden eagle and its nests.

f. Agriculture.

1) Permittees and other regular users of public lands and National Forest affected by construction of the project would be notified in advance of any construction activity that could affect their businesses or operations. This would include but not be limited to signing of temporary road closures, removal and/or cutting of fences, disturbances to range improvements, or other range use-related structures. (Also applies to Land Uses.)

2) If a natural barrier used for livestock control is broken during construction, the applicant would adequately fence the area to prevent drift of livestock. Fence specifications would be determined on a case-by-case basis.

3) Gates or cattle guards on established roads would not be locked or closed by the applicant.

g. Transportation.

1) A transportation plan would be submitted for review and approval by the BLM and FS. This plan would cover approval of temporary, reconstructed, and newly constructed roads and would include clearing work, rehabilitation, and uses associated with transportation needs. Overland access could be specific in lieu of road construction or reconstruction.

2) Access roads necessary for operation and maintenance of the shale oil pipeline would be clearly identified. Some of these access roads would ostensibly be open for public use, including but not limited to, ORV vehicular travel.

3) Where possible, the right-of-way itself would be used as an access road only during the construction period. The authorized officer would require that the access roads paralleling this pipeline be closed and vegetative cover reestablished. No maintenance roads along the pipeline route would be permitted. (Any other roads providing acess to the pipeline would be restricted by the provisions in item g. 1).

h. Recreation.

1) The FS and BLM would direct the applicant to control ORV vehicle use on the right-of-way. Such specified control could include use of physical barriers, replanting trees, or other reasonable means of vehicle control.

i. Cultural Resources.

1) All significant cultural resources identified on any proposed synfuels project area would be avoided wherever possible. For those significant cultural resources that could not be avoided, a Memorandum of Agreement (MOA) with the Advisory Council of Historic Preservation and the Utah State Historic Preservation Office would be developed that details specific mitigation measures in accordance with 36 CFR 800. All cultural resources discovered during construction that were not previously identified would be left undisturbed until they could be evaluated for significance.

j. Visual Resources.

1) Edges of right-of-way vegetative clearing would be feathered to avoid the appearance of straight lines along the pipeline right-of-way.

2) A plan to minimize visual impacts from pipeline rights-of-way clearing and structures would be required. The applicant would prepare photographic simulations as directed of areas in which facilities were proposed within foreground-middleground areas of high scenic value or sensitivity. Using the simulation as a guide, the applicant would design and locate the pipeline routes and ancillary structures to blend into the existing environment. The authorizing agency would evaluate and approve measures before construction began.

k. Paleontology.

1) The applicant would provide a qualified paleontologist who would be approved by the authorized officer. The paleontologist would conduct an intensive survey of all areas to be disturbed according to the significance and mitigation needs outlined in Appendix H-1. An approved paleontologist would be available, as needed, during surface disturbance. If the

paleontologist determined that values would be disturbed, construction would be halted until appropriate action could be taken.

l. Land Uses.

1) Disturbance of improvements such as fences, roads, and watering facilities during the construction and maintenance of the rights-of-way would be kept to an absolute minimum. Immediate restoration of any damage to improvements to at least their former state would be required. Functional use of these improvements would be maintained at all times. When necessary to pass through a fence line, the fence would be braced on both sides of the passageway prior to cutting of the fence. A gate acceptable to the authorizing agency official would be installed in the gate opening and kept closed when not in actual use. Where a permanent road is to be constructed or maintained, cattleguards would be placed at all fence crossings. (Also applies to Agriculture.)

m. Other measures dealing with Construction Techniques and Health and Safety.

1) Helicopters would be used to string pipe and deliver equipment in areas where access to the terrain or management constraints preclude standard construction methods or where designated.

2) Garbage and other refuse would be disposed of in an authorized disposal site or landfill. Engine oil changed would be contained in suitable containers and disposed as refuse; no fuel, oil, or other hydrocarbon spill would be permitted. If such spill accidentally occurred, the contaminated soil would be excavated and the authorized officer notified immediately.

3) On National Forest lands the right-of-way would coincide with the existing Chevron Oil Pipeline right-of-way, except where restrictive terrain conditions would require additional width for both construction and permanent right-of-way needs. The authorized officer would establish right-of-way widths on a case-by-case basis.

4) The applicant would comply with applicable Federal and State laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other similar substances) in all activities and operations. The applicant would obtain approval of a joint operation plan (BLM/FS) prior to the use of such substances from the BLM and/or FS authorized officer(s). The plan would provide the type and quantity of material to be used; the pest, insect, fungus, etc., to be controlled; the method of application; the location of storage and disposals of containers; and other information that the BLM District Managers or Forest Supervisor

may require. The plan would be submitted no later than December 1 of any calendar year that covers the proposed activities for the next fiscal year (i.e., December 1, 1982, deadline for a fiscal year 1983 action). If the need for emergency use of pesticides is identified, the use would be approved by BLM District Managers or Forest Supervisors. The use of substances on or the rights-of-way and temporary permit areas would be in accordance with the approved plan. A pesticide would not be used if the Secretary of the Interior has prohibited its use. A pesticide would be used only in accordance with its registered uses and with other Secretarial limitations. Pesticides would not be permanently stored on Federal lands.

5) Within 30 days after conclusion of construction and operation, all construction materials and related litter and debris would be disposed of in accordance with instruction of the authorized officer.

6) A fire control plan would be included in the construction and operation plan. The applicant would do everything reasonably possible, both independently and upon request of the authorized officer, to prevent and suppress fires on or in the immediate vicinity of the right-of-way or permit area. This would include making available such construction and maintenance force as might be reasonably obtained for the suppression of fires.

3. U.S. Fish and Wildlife Service

For protection of the habitat of the Colorado squawfish, humpback chub, bony-tail chub, and razerback sucker, the applicant would be required to implement the following construction and operational measures at the White and Green River pipeline crossings and Lower Duchesne River pipeline crossing south of U.S. Highway 40.

a. Excavation at the river pipeline crossings would be done at periods of low water to minimize siltation, with no construction permitted between July 1 and August 15.

b. River pipeline crossings would not be constructed in backwater areas. These areas are beneficial to squawfish and humpback chub reproduction through the formation of backwater nursery areas.

c. Automatic shut-off valves would be installed on the pipe. This would include valves on both the east and west sides of the Wyasket Bottom (proposed marsh) area, as well as on both banks of the Green River.

d. Emergency oil spill clean-up equipment (booms and skimmers) would be located adjacent to the river pipeline crossings.

e. Reseeding with native grasses and forbs would be required on the wildlife refuge.

4. U.S. Army Corps of Engineers

The Corps of Engineers has prescribed management practices that should be followed to the maximum extent practical, for discharges covered by the Nationwide Permit (items a through h below). Additionally, certain conditions (33 CFR 323.4-3(b)) would have to be met under the Nationwide Permit authority (items i through q below). For further detail, refer to the COE Permit Program, "A Guide for Applicants," November 1, 1977.

a. Discharges of dredged or fill material into United States water should be avoided or minimized through the use of other practical alternatives.

b. Discharges in spawning areas during spawning seasons should be avoided.

c. Discharges should not restrict or impede the movement of aquatic species indigenous to the waters, impede the passage of normal or expected high flows, or cause the relocation of the waters (unless the primary purpose of the fill is to impound waters).

d. If the discharge creates an impoundment water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow should be minimized.

e. Discharges in wetlands areas should be avoided.

f. Heavy equipment working in wetlands should be placed on mats.

g. Discharges into breeding and nesting areas for migratory waterfowl should be avoided.

h. All temporary fills should be removed in their entirety.

i. There would not be any change in preconstruction bottom contours. (Excess material would be removed to an upland disposal area.)

j. The discharge could not occur in the proximity of a public water supply intake.

k. The discharge could not occur in areas of concentrated shellfish production.

l. The discharge could not destroy a threatened or endangered species as identified under the Endangered Species Act or endanger the critical habitat of such species.

m. The discharge could not disrupt the movement of those species of aquatic life indigenous to the waterbody.

n. The discharge would have to consist of suitable material free from toxic pollutants in other than trace quantities.

o. The fill created by a discharge would be properly maintained to prevent erosion and other nonpoint sources of pollution.

p. The discharge could not occur in a component of the national wild and scenic river system or in a component of a state wild and scenic river system.

q. No access roads, fills, dikes, or other structures could be constructed below the ordinary high water of the streams under the Nationwide Permit. These structures would require separate section 404 permits.

B. Measures Required on Non-Federal Lands.

1. University of Utah

In order to avoid conflicts with the University of Utah Master Plan for facility planning and construction, the University would stipulate the following construction and right-of-way measures:

a. Applicant would stay within or east of the existing Chevron Oil and Mountain Fuel gas pipeline rights-of-way from the vicinity of Emigration Canyon to Red Butte Creek.

b. Applicant would stay within existing Chevron Oil and Mountain Fuel gas pipeline rights-of-way from Red Butte Creek to Dry Creek Canyon drainage.

c. Applicant would coordinate actual pipeline location with the future location of Salt Lake City's 11th Avenue road prism, i.e., place pipeline under proposed road surface. This future road location is proposed to parallel or occupy the existing pipeline rights-of-way across University land.

2. Uintah and Ouray Indian Reservation

The Ute Indian Tribe is a local sovereign government with specific land use requirements. Final approval of mitigation measures and stipulations would require application to the Uintah Ouray Agency, Bureau of Indain Affairs (BIA). Decisions of action would be made through the Ute Tribal Business Committee on a case-by-case basis. Negotiations conducted for the applicant's alternative pipeline would not necessarily reflect on decisions for other companies seeking agreements with the Ute Indian Tribe.

The Ute Indian Tribe intends that those measures listed for lands and/or resources administered by Federal agencies be applicable to authorizations they may issue for Tribal land use.

The following are some of the provisions (mitigation measures) that would be included in a Surface Use and Operating Plan for pipeline construction, operation, and maintenance on reservation lands.

a. Water.

1) For pollution control, the applicant would be required to locate oil-spill clean-up equipment (booms and skimmers) at all river crossings on Indian tribal lands.

b. Vegetation.

1) Employees of the applicant, including subcontractors, would not gather firewood. It is the policy of the Ute Indian Tribe and the BIA to require wood permits from the Forestry Section of BIA for both Indians and non-Indians harvesting wood from the Uintah and Ouray Reservation.

2) The applicant would be required to develop a plan for controlling noxious weeds along rights-of-way for roads, pipelines, or other applicable faciities. County weed boards would be contacted for a listing of noxious weeds to be controlled.

c. Soils and Agriculture.

1) A procedure would be developed to restore roads, or other disturbed areas to near their original condition. This procedure should include: (a) stockpiling of top soil; (b) establishing original ground contour; (c) reestablishing irrigation systems where applicable; (d) reestablishing topsoil to the ground surface on disturbed areas; (e) on irrigated fields, reestablishing soil conditions in such a way as to ensure cultivation and harvesting of crops; (f) a procedure to ensure revegetation of the disturbed areas to the specifications of the Ute Indian Tribe or the BIA.

d. Recreation.

1) Camping and fishing on Uintah and Ouray Reservation properties would require permits.

e. Transportation.

1) All roads constructed by the applicant on the Uintah and Ouray Indian Reservation would have appropriate signs. Signs would be neat and of sound construction. The signs would state: (a) the land is owned by the Ute Indian Tribe; (b) the name of the company; (c) prohibition of firearms to all non-Ute Tribal members; (d) permits from the Bureau of Indian Affairs must be obtained before cutting firewood or other timber products; and (e) only authorized personnel permitted.

2) Employees of the applicant, including subcontractors, would be confined to established roads and authorized sites.

f. Wildlife.

1) The "duck pond" development (M.P. 48.0) would be avoided by all construction activities.

2) The Ute Indian Tribal Fish and Wildlife Conservation Officers and Law and Order Officers would be contacted by the applicant for protection of wildlife and trespassing offenses.

3) Employees of the applicant, including subcontractors, would be prohibited from carrying firearms that could be used to kill game animals.

g. Cultural Resources.

1) The Ute Indian Tribe would require a complete archeology inspection of property disturbed by pipeline construction within Uintah and Ouray Reservation boundaries.

h. Other Measures Dealing with Right-of-way Permitting, Construction Techniques, and Health and Safety.

1) It would be the policy of the BIA and the Ute Indian Tribe to make rights-of-way available without cost to oil shale companies when both mineral rights and surface rights were owned by the Ute Indian Tribe. It would be the policy that the right-of-way be approved and a charge be assessed for damages prior to the time the oil shale company began any construction activities; and if the surface was owned by another entity and the mineral rights were owned by the Ute Indian Tribe, rights-of-way would be cleared with the other entity.

2) Permits would be required for water or soil fill material obtained from reservation lands. The applicant would submit a plan indentifying (a) the approximate amount of water or material needed, (b) the owners of the rights to the water or materials, (c) the location from which water or materials would be obtained, and (d) the approximate time period in which water or materials would be used.

3) Acceptable oil spill mitigation measures would be required prior to granting of access or construction permits.

4) A procedure would be required of the applicant and subcontractors to keep applicable sites free from litter and groomed in a neat and professional condition.

5) A bench mark would be established near each authorized use in a location where it would not be destroyed. The bench mark would

be set in concrete with a brass cap. The brass cap would show the use number and elevation to the nearest one-tenth of a foot. The engineering drawing showing the cuts/fills for the use would also show elevations in relation to the bench marks.

3. State of Utah

   a. The applicant is required by Utah Code Ann. Section 63-51-10 (Supp. 1981) to submit a financial impact statement or plan to alleviate socioeconomic impacts. Approval of the applicant's plan would be required before issuance of any state permits required to start construction.

SECTION 2 (MEASURES DEVELOPED AS A RESULT OF IMPACT ANALYSIS)

A. Measures Required on Federal Lands, i.e., land administered by BLM and FS, and Measures Recommended by Federal Agencies for Water and Wildlife Resources on Non-Federal Lands.

1. Fishery and Wildlife Measures.

   a. Construction Schedule (Site Specific)

      Certain wildlife species would be adversely affected if pipeline construction took place in their habitats during critical periods in their life cycles. The construction schedule could avoid some of these critical periods therefore minimizing conflicts and resultant impacts. Other critical periods for wildlife coincide with construction schedules and alternatives might be available. All critical habitats and use periods for the alternative are expressed in the following tables. Alterations in the alignment of the pipeline could eliminate some areas; it could also potentially add other conflicting areas.

      Measure: The critical wildlife habitats and periods expressed in the table would be avoided during construction of the alternative, unless direction is otherwise given from the authorized officer. Streams would be crossed during the listed crossing date, unless direction is otherwise given.

      Effectiveness: Avoiding the areas listed in Table 21 would eliminate potential impacts to wildlife habitats and species of concern, including those which would be affected if the construction schedule changed for any reason. Crossing streams during dates listed in Table 22 would eliminate potential impacts to aquatic wildlife and species of concern.

      The measure would be applied to the alternative as indicated in tables 21 and 22.

Table 21

Dates and Wildlife Habitats to be Avoided
Along the Alternative Pipeline Corridor

Approximate Mileposts	Dates When Construction Would be Avoided	Reason
White River Crossing (6.7)	March 15 thru July 15	Waterfowl nesting
10 - 17	May 10 thru June 20	Antelope fawning
18 - 22	March 15 thru July 15	Waterfowl nesting (National Wildlife Refuge)
25 - 27	March 15 thru July 15	Raptors-waterfowl nests
47 - 51	March 15 thru July 15	Waterfowl area
94 - 103	May 16 to July 1	Elk & deer fawning/calving
121 - 125	March 15 to July 15	Raptor habitat
140 - 142	May 16 to July 1	Deer fawning
139 - 157	October 31 to April 30	Big game winter range

Source: USDA, Forest Service, Uinta National Forest, Alvin Mills - Fisheries Biologist, 1982.

Table 22

Recommended Crossing Dates for Streams

Nearest Milepost	Suggested Crossing Period	Comments
White River 6.7	August 15 to October 15	Lowest flows - Coordinate with release schedules
Green River 21	August 15 to October 15	Lowest flows - Coordinate with release schedules
Duchesne River 49	August 1 to October 15	Low flows - Coordinate with BR* - Stops flows to minimum.
Rock Creek 68	August 1 to October 1	Low flows - Indian lands brown trout fishery
Duchesne River 71	Late fall and winter	Low water; no flow controls
Duchesne River 74	February	---
Duchesne River 87	August 15 to October 1	Private land
Duchesne River 90	August 15 to October 1	Low water - Late fall
West Fork Duchesne River 91 - 93	August 1 to October 1	Multiple Crossings - Low water - Fall constr.
Spring Creek 92	August 1 to October 1	Low water
Wolf Creek 94	August 1 to October 1	Low water
Wolf Creek 100	August 1 to October 1	Low water

* BR - Bureau of Reclamation

Table 22 (cont'd)

Recommended Crossing Dates for Streams

Nearest Milepost	Suggested Crossing Period	Comments
So. Fork Provo River 105 & 107	July 15 to September 15	Reproduction Area
Provo River 110-111 & 115	July 15 to September 15	Rearing water
Silver Creek 134	July 15 to September 15	---
Kimball Creek 132	July 15 to September 15	---
Mountain Dell Creek 143	August 15 to October 1	Brown trout
Emigration Creek 144 & 148	July 15 to September 15	Cutthroat - Private
Red Butte Creek 150	July 15 to October 1	Brown trout
City Creek 154	August 15 to October 1	Brown trout

Source: USDA, Forest Service, Uinta National Forest, Alvin Mills - Fisheries Biologist, 1982.

b. Restricted Access. (General)

Measure: In order to reduce harassment to wildlife, particularly big game animals on their winter ranges, all construction access roads would be decommissioned to eliminate public access. If access roads were necessary for operation and maintenance, they would have to be approved by the authorized officer. To protect sensitive wildlife habitat, the authorized officer would require that the roads be clearly marked "No Access Except Authorized Vehicles." In high use areas BLM or FS would direct the applicant to install and maintain gates to limit access.

Effectiveness: This measure would be successful in reducing increased public access to critical game areas which would be created by new access roads along the pipeline right-of-way. However, in some areas, vandalism to gates might require frequent monitoring and maintenance.

c. Camping and Vehicle Parking. (General)

Measure: No camping or parking would be allowed at or near any livestock watering source, artifical water source, or spring, so that use by wildlife and domestic livestock would not be hampered. The restricted area would be determined by the authorized officer; the recommended distance would be 2 miles in big game concentration areas and 1 mile in upland game and other wildlife situations.

Effectiveness: Restricting camping or parking by construction crews would eliminate harassment of animals needing water. This measure would be especially effective in minimizing impact in upland game bird management areas and wildlife concentration areas. It would also alleviate unintentional interference with wildlife along the entire right-of-way.

d. Steam Crossings and Riparian Vegetation. (General)

Measure: During stream crossings and when traversing riparian vegetation zones, especially adjacent to the water course, every care would be taken to create minimum disturbance to live vegetation in this most important aquatic and terrestrial wildlife habitat type. Also, all larger live trees and dead snags would be left standing in good repair to benefit raptors and numerous other wildlife forms that inhabit this zone.

Effectiveness: This measure would be expected to maintain the productivity and diversity of the extremely important riparian and stream side zones and spare undesirable impacts where possible.

B. Uncommitted Measures Proposed by Local Governing Groups, Municipal Entities, and Private Landowners.

1. Introduction.

The rights and obligations of Tosco applying to its use of private lands would be set out in the terms of the easement, an agreement between the Tosco and the landowner. Terms of the easement would include: the width and location of the right-of-way; the granting of permission to construct, replace, maintain, use, and remove facilities as described; the granting of right of ingress and egress to the facilities; the right to mark the facility; the obligation of the landowner to maintain cover over the buried facilities; some restrictions placed on the use of the right-of-way by the landowner; and the restoration or mitigation measures that are to be performed by Tosco to satisfy the requirements of the landowner. (Refer to statement made on page 89 of the Chapter 3 - Environmental Consequences, regarding analysis of impacts on private lands in light of uncommitted mitigation).

2. Kamas Valley Soil Conservation District Board.

a. Soils and Agriculture.

1) To prevent additional disturbances to marginal farmlands (shallow rocky soil) and irrigation systems, the applicant should stay within the existing Cheveron Oil Pipeline right-of-way across Kamas Valley. The existing right-of-way width is between 33 to 55 feet wide.

2) The applicant should be responsible for project related interruptions to established irrigation systems during the life of the project. Under the direction of the landowner, the applicant should repair disturbances to the irrigation systems and eliminate the causes of the disturbances.

3) Noxious weed control along the pipeline route should be coordinated with the County Weed Boards. The applicant should be responsible for noxious weed control in disturbed areas along the pipeline route for the first 2 seasons after construction.

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GLOSSARY

A-WEIGHTED SOUND LEVEL (dBa) - The measurement of sound approximately the auditory sensitivity of the human ear.

ADSORPTION - The surface retention of a solid, liquid, or gas molecules, atoms, or ions by a solid or liquid, as opposed to absorption, the penetration of substances into a bulk of the solid or liquid.

AMBIENT NOISE LEVELS - Expected background noise in an area.

ANIMAL UNIT MONTH (AUM) - The amount of forage necessary for the sustenance of one cow or its equivalent for one month (usually 800 lbs. of air dry forage).

AVERAGE DAILY TRAFFIC (ADT) - The total number of vehicles traveling both directions on a section of road during a time period divided by the number of days in that time period.

BENDING - Forming of pipe, by pressure, into a curved or angular shape to fit contour of land being crossed.

BENTHIC - Of, pertaining to, or living on the bottom or at the greatest depths of a body of water.

BIOENERGETICS - The branch of biology dealing with energy transformations in living organisms.

CATHODIC PROTECTION - Anticorrosion technique for metal installations--pipelines, tanks, buildings--in which weak electric currents are set up to offset the current associated with metal corrosion.

CHISELING - The loosening of soil without inversion and with a minimum of mixing of the surface soil in order to shatter restrictive layers (below normal plow depth) that could inhibit water movement or root development (called "chiseling" when the restrictive layers are less than 16 inches deep).

CLUTCH - A nest of eggs or a brood of chicks.

COLLOIDAL - An intimate mixture of two substances, one of which, called the dispersed phase (or colloid), is uniformly distributed in a finely divided state through the second substance, called the dispersion medium, the dispersion medium or the dispersed phase may be a gas, liquid, or solid.

CULTURAL RESOURCES - Those fragile and nonrenewable evidences of human activity, occupation, or endeavor, reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features, that were of importance in human events. Cultural resources are further categorized in terms of their prehistoric and historic values; however, each of these aspects represents a part of the continuum of events from the earliest evidences of man to the present day.

DISPERSED RECREATION - Camping in undeveloped sites and informal daytime recreation.

DIVERTING METHOD - A method of installing pipe in streams where the flow is temporarily diverted.

DOUBLE TRENCHING - The practice of separating the topsoil from the subsoil during trench excavation.

ELECTROLYSIS - Chemical reactions carried out by passage of electric current through a solution.

ENDANGERED - Endangered means any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary of the Interior to constitute a pest, whose protection under the provisions of the Endangered Species Act would present an overwhelming and overriding risk to humanity (P.L. 93-205, Enangered Species Act 1973).

EXPOSURE - The general surroundings of a site, with special reference to its openness to winds and sunshine.

EYRIE - Nesting area for birds of prey.

FAULT (GEOTECHNICAL) - Fracture in the earth's crust accompanied by a potential shifting of one side of the fracture in relation to the other side; the point at which a geological strata "breaks off" or is sheared when a section of the strata drops because of settling.

FAULTING - The process of producing a fault, a surface or zone of rock fracture along which there has been displacement. Faulting generally extends into unconsolidated sediments on top of the faulted rock.

FORB - A low growing broadleaf plant.

GUZZLER - Artificial watering device for wildlife.

HARROWED - Soil cultivated with a harrow (an implement pulled over plowed soil to break clods, level the surface, and destroy weeds).

HYDROSTATIC TESTING - Filling a pipeline or tank with water under pressure to test tensile strength.

INTERMITTENT STREAM - A stream which flows only during periods of precipitation.

LEKS - Sage grouse strutting ground (courtship areas) generally found in open grassy areas and sagebrush.

MASS WASTING - Loose rock and soil movement associated with large land sliding actions.

MILL SCALE - Surface layer of ferric oxide (FE_3O_4) that forms on steel or iron durinng hot rolling.

MITIGATION - The abatement of diminution of construction impact to the environment by (1) avoiding a certain action or parts of an action, (2) employing certain construction measures to limit the degree of impact, (3) restoring an area to preconstruction conditions, (4) preserving or maintaining an area throughout the life of a project, or (5) replacing or providing substitute resources to the environment.

MULCH - Materials such as wood chips or straw on the soil surface to prevent evaporation or erosion or to enrich the soil.

NATIONAL REGISTER OF HISTORIC SITES - A list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture.

OVERBENDS - Portions of a pipeline trench constructed over convex topographic features, i.e., hills or mounds as opposed to a trench constructed through a depression or concave topographic feature.

OIL SKIMMERS - Mechanical implements used to remove oil spills from the surface of water bodies.

PERENNIAL STREAM - A stream which contains water at all times except during extreme drought.

PIPELINE WELDING - Bringing bevelled ends of two joints together and aligning them with line-up clamps. Qualified welders, under strict quality control conditions, join two sections of pipeline using courses of weld-metal called beads in a series of passes designated as: 1) stringer bead, 2) hot pass, 3) third pass or hot fill (for heavy-wall pipe), 4) filler pass, and 5) final or capping pass.

RIPARIAN VEGETATION - Vegetation which grows in and is dependent upon moist or wet soils.

RUMINANT - Characterized by the the act of regurgitation and rechewing of food. a mammal belonging to the Rumminantia.

SILVICULTURAL - Theory and practice of controlling the establishment, composition, and growth of stands of trees for any of the goods and benefits that they may be called upon to produce.

SITE (CULTURAL RESOURCES) - A physical location of past human activities or events. It is a discrete locus of activity that is presumably interpretable. A site may be indicated by clusters of objects, presence of features, or occurrence of subsurface cultural bearing deposits. It is recognized that cultural resource sites are extremely variable in size and shape and may consist of secondarily deposited cultural resource remains.

SPREAD - A team of construction personnel and equipment required to construct an identified segment of pipeline.

STRATIGRAPHY - A branch of geology dealing with the classification, correlation, and interpretation of stratified rocks. Also, the sequence and description of such rocks in a specific area.

STRINGING PIPE - Placing sections of pipe end to end along a pipeline right-of-way in preparation for welding the joints together to form a pipeline.

TALUS - Coarse and angular rock fragments derived from and accumulated at the base of a cliff or steep, rocky slope.

THREATENED - Threatened means any species which is likely to become endangered within the foreseeable future throughout all, or a significant portion of its range (P.L. 93-205, Endangered Species act 1973).

TOPSOIL - The surface tilled layer in cultivated areas or the uppermost layer of soil containing organic layer (A horizon).

TROPHIC - Pertaining to or functioning in nutrition. Trophic level is any of the feeding levels through which the passage of energy through an ecosystem proceeds.

UNDERSTORY - An underlying layer of low growing vegetation.

VISCOSITY - The physical properties of a fluid that enables it to develop and maintain shearing stress dependent upon the velocity of flow and then to offer continued resistance to flow.

APPENDIX A

OIL PIPELINE RUPTURE AND SPILL ANALYSIS

INTRODUCTION

The pipeline would be designed in compliance with applicable regulations including 49 CFR 195 and the code for pressure piping, ANSI B 31.4. These regulations include Federal standards for accident reporting, pipeline specifications construction methods, testing and safety equipment. Planned pipeline specifications are listed in Table A-1.

The pipeline would be equipped with two pressure control (reducing) stations. The first would be downstream of the 6900-foot high point of the pipeline (MP 141) and the second just upstream of storage tanks near the Salt Lake refineries (MP 158). Pressure control stations would be unmanned.

Manually operated gate valves would be installed below grade at 10-mile intervals and at specified river and canal crossings. Proposed valve locations are given in Table A-2.

A leak would be detected by monitoring pressure drop on the pipeline. Pressure sensors would be located at pump stations 2 (MP 44) and 3 (MP 88) and monitored at a manned station on the Sand Wash site. Leaks would be located by aircraft reconnaissance, and a crew would be dispatched by truck from either the Sand Wash Site or Salt Lake City depending on the estimated shortest travel time. The time of detection and pumping shutdown is estimated as several minutes. Spill volumes are estimated for analysis purposes on the basis of a truck crew averaging 40 miles per hour to the site of the spill. Estimated spill volumes for river crossings and critical land spill areas listed on Table A-3 are based on a complete rupture of the pipeline.

Actual spills could be more or less than the amounts indicated in Table A-3 depending on circumstances, such as a break during the night, under snow cover, or in a location where it would be difficult to see from aircraft. Other variables that could affect the actual spill amounts are the availability of a trained crew and the technological ability to detect a leak.

Spills of significant quantity could occur as leaks rather than catastrophic breaks. For example, a leak of 100 barrels per day (bpd) sixty miles from a pump station would result in a pressure drop of only 4 to 5 pounds per square inch (psi); and a pressure loss of only 16 psi at the Sand Wash site could be the result of a 250 bpd leak 20 miles from the site. The most accurate pressure gauges are accurate to only about 10 psi intervals. An additional complication in monitoring pressure drop is that changes in oil temperature, viscosity, and density can affect pipeline pressure.

The predicted spill quantity for the lifetime of the entire pipeline is an average of 60 barrels per year with a frequency of one spill about every third year.

Table A-1

Pipeline Specifications

	Segment A	Segment B	Segment C	Segment D
Interval Mileposts	0-47	47-89	89-142	142-160
Outside Diameter, inche	10.75	10.74	10.75	10.75
Wall Thickness, Inches	0.334	0.365	0.344	0.344
Design Press, psi	1700	1800	1600	1700
Length, miles	47	42	53	18

Source: Tosco, 1982.

Table A-2

Section and River Crossing Valve Locations

Section or Location	Section From Milepost	Section to Milepost	Distance Between River Crossing Valves
1	0	6.7	
White River	6.7		600 feet
2	6.7	10	
3	10	20.7	
Green River	20.7		1,500 feet
4	20.7	26.8	
Duchesne River	26.8		750 feet
5	36-39 (3 crossings)		260 feet
6	39	44.5	
Canal	44.5-47.5		200 feet each
7	47.5	48.1	
Duchesne River	49.6		
8	49.6	60	
9	60	71.7	
Duchesne River			1,000 feet
10	71.7	75.6	
Duchesne River	75.6		3,000 feet
11	75.6	80	
12	80	88.2	
Duchesne River	88.2-88.4 (2 crossings)		2,000 feet (Total)
13	88.4	91.7	
Duchesne River	91.7		1,000 feet
Duchesne River	93.2		1,500 feet
14	93.2	98	
15	98	106.8	

Table A-2 (cont'd)

Section or Location	Section From Milepost	Section to Milepost	Distance Between River Crossing Valves
Provo River	106.8		750 feet
Provo River	108.6		750 feet
16	108.8	110.5	
Provo River	110.5-111.6 (2 crossings)		1,900 feet
Provo River	112.6		500 feet
Provo River	115.8		750 feet
17	115.8	125	
18	125	136	
19	136	146	
20	146	160	

Source: Tosco, 1982.

Table A-3

Assumed Spill Locations and Quantities

River Crossings	Milepost Milepost	Estimated Maximum Total Spill (in barrels)[a]
White River	6.7	718
Green River	20.4	990
Duchesne River	91	7550
Provo River	107	3490
Parley's Summit (Alexander Creek)	139	4000
Emigration Creek	144	3600
City Creek	154	2000
Land Areas		
Ouray National Wildlife Refuge	18-21	990
Uinta Mountain and Plateau Area	95-99	4400
Wolf Creek Pass Area	99-102	3145
Kamas Valley	112-122	5200
Parley's Summit	139-143	4000
Salt Lake City Foothill Area	148-152	2800

a. 1 barrel equals 42 gallons

Source: Tosco 1982 and BLM/FS Study Team for the SLC Alternative Product Pipeline, 1982.

This section describes the expected impacts that would result from major oil spills along the Tosco shale oil alternative product pipeline route to Salt Lake City. The impact discussions are organized into a general and a site-specific section for each affected resource. Only those resources that could be significantly affected by an oil spill are addressed. Resources not expected to be significantly affected by oil spills include noise, wilderness, geology, paleontology, and land use plans.

A-1 SOCIOECONOMICS

General Impacts

Varied economic effects from oil spills would result from damage to resources, crops, and developed facilities. Also, the cost of cleanup may be substantial. In addition, an economic loss (up to an estimated maximum of $225,000) could result from the unrealized value of the spilled oil. Social impacts would relate mostly to inconvenience to people and traffic affected by the spill and cleanup activities.

Specific Impacts

Stream Crossings

The most socioeconomically disruptive stream crossing spill would most likely occur with 4000 barrels released at Parley's Summit (Alexander Creek) because of effects on Mountain Dell Reservoir and impacts to related domestic water supply features for a long period of cleanup and rehabilitation. This would have high damage and cleanup costs as well as affect many Salt Lake City residents with inconvenience and perhaps limited water supplies.

The second most socioeconomically disruptive stream crossing spill would occur in the Provo and/or Duchesne Rivers where the waters are used for agricultural and recreation purposes.

Land Areas

The worst socioeconomic impacts from a land spill would occur with 2800 barrels of hydrotreated shale oil spilled in the Salt Lake City foothill area. The shale oil could spread over a large area on paved and unpaved surfaces. Damage could occur to residential properties, schools, businesses, and other urban features. Vehicular and pedestrian traffic would be disrupted to avoid the spilled oil in streets, gutters, and walkways. Those people not avoiding it, either through inattention or knowingly, may have soiled clothing, vehicles, pets, etc. Fire hazard from the spilled oil would require fire department attention and control to avoid potentially extensive secondary losses to urban structures.

The second worst socioeconomic impact area for a land spill would be in Kamas Valley where long term impacts to cropland would result in economic losses from reduced production of meadow hay and alfalfa.

A.2 AIR QUALITY

Accidental Burning of spilled oil (or intentional burning used as a part of the cleanup process) would create temporary degradation to air quality. Such an impact to air quality would be of low significance to the air resource, however, the burning would be visually noticeable and could be of concern as related to safety and fire control.

A.3 WATER RESOURCES

General Impacts

The oil spills tabulated in Table A-3 could possibly create unacceptable pollution in the major rivers addressed. The section on wildlife addresses the impacts of such spills on wildlife. The section on land use discusses the impacts of an oil spill on surface waters and watershed areas. Other less direct impacts of oil pollution in surface waters such as a recreation, are addressed in the appropriate resource section.

Specific Impacts

Stream Crossings

It is estimated that the worst case for oil spill in or along a stream would be a spill located in the Duchesne River system. It has been estimated that as much as 7,550 barrels of oil could be spilled in the area of milepost 90. The Duchesne River was chosen because it would be affected by the largest expected oil spill and because of the river's excellent quality and high use. The river is used for domestic water supply, irrigation, by wildlife, for fishing, and as a rearing habitat for trout.

Tests on oil shale indicate that even after the oil is hydrotreated it still contains concentrations of arsenic, cadmium, and selenium in excess of that allowed by Utah State standards. This could result in dangerous levels in the water of the Duchesne River, depending upon dilution factors.

Specific secondary impacts due to spills in surface waters are also addressed in the wildlife, soil, watershed, recreation other appropriate sections.

Land Spills

The movement of petroleum products in soil would vary with the volume of the product, the physical properties of the product, the structure of the subsoil, the nature of the ground water system and the weather. Oil spilled on undistrubed ground would move downward at a rate dependent on the viscosity of the oil and permeability of the soil. The downward movement eventually would be interrupted by one of three events: the oil would be exhausted to immobility; it would encounter an impermeable bed; or it would reach the water table.

Exhaustion to immobility or the encounter of an impermeable bed only would lessen the risk of ground water pollution. It would not remove the likelihood of contamination.

Most of the insoluble oil fractions that reach a water table would be suspended or would float at or near the surface of the water. The oil would tend to move with the water, but it would be absorbed continually by soil particles that it contacts. Thus, the volume of oil being transported would shrink. If the water table drops, the oil would follow; and some oil would continue to move laterally with the ground water.

When rainwater passes through the oil in the soil, it would pick up soluable fractions of the oil and carry them into the ground water system. The net result of oil/ground water/soil interaction would cause the hydrocarbons to travel more slowly than the ground water and thus persist longer in a given area.

Once oil has entered the ground water, it would be almost impossible to remove. Contaminated groundwater may ruin a potable water source for generations.

A.4 VEGETATION, SOILS, AND RECLAMATION

General Impacts

Stream Crossings

Oil-covered grass, forb, and small brush riparian species immediately adjacent to water courses would be killed; the soil would not support growth of such species until bacterial action broke down the oil, the oil contaminated soil was cleaned by water level fluctuations, or the contaminated soil was physically removed.

Oil in sandy soils along riparian areas would be subject to faster natural removal by water level fluctuation (natural cleaning) than would oil in clay soils (Federal Water Pollution Control Administration 1968); therefore, grass, forb, and brush riparian species would reestablish faster on sandy soils. Such natural reestablishment could result within 1 to 2 years after the spill

(depending on the frequency and duration of water level fluctuations and natural cleaning action).

Oil-covered large brush and tree riparian species associated with all river and stream crossings would survive; these species could experience some level of growth reduction, depending on plant surface area affected (EPA 1974). Some loss of foliage would occur during the ongoing growing season and/or the following growing season.

Land Areas

Oil-covered grass, forb, and small brush species would be killed; the soil would not support growth until bacterial action broke down the oil or the soil was removed from the site and the substrate was reconditioned to support plant growth.

Oil-covered large brush and tree species would survive but could experience some level of growth reduction as previously explained.

Spills on sandy soils would penetrate deeper into the soil profile than spills on clay or loamy soils with resulting longer periods required for successful plant reestablishment and normal growth (Federal Water Pollution Control Administratrion 1968). Oil would become adsorbed on clay particles on the soil surface, with less penetration into the soil profile and, subsequently, less impacts on deep rooted plants.

Specific Impacts

Stream Crossings

White and Green Rivers Crossings

Vegetation

Due to the width of the watercourses and distance between the high water flow elevation and the main body of riparian vegetation, minor amounts of plant species would be covered and killed. Plant species covered and/or killed would be located mainly on downflow riverbanks at turns in the river course.

Riparian vegetation along the White River would be affected from the point of the spill to its confluence with the Green River (approximately 16 miles). Most impacts to riparian vegetation would occur in the first 8 miles where oil concentrations would be high.

Riparian vegetation along the Green River would be affected from the point of the spill for an unknown number of miles downstream. Due to the ratio of water surface area to the quantity of oil spill and the low viscosity of the shale oil, oil concentrations would be low after the first mile; and impacts to riparian vegetation would be minor.

Soil

The soils within the riparian areas of the rivers are sandy. Oil concentrations in the soil could be considerably reduced within 1 to 2 years following the spill; therefore, natural reestablishment of grass, forb, and small brush species along the riverbanks would be expected to occur within or shortly after this period.

West Fork of Duchesne River, Provo River, Emigration Creek, and City Creek Cossings

The quantities of the potential oil spills, variable ranges in water velocities, and narrow widths of the actual water occupied river and stream crossings would influence the amount and duration of impacts to riparian vegetation.

Riparian vegetation along these watercourses grows up to the water's edge and is frequently inundated during late spring and early summer water runoff periods. Most grass, forb, and small brush/tree species occupying the streambanks and/or stream channels would be killed, and growth of large brush and tree species would be reduced. The extent of the impacts would depend on the season of spill, with more of the riparian area affected (width and length) during the late spring and early summer water runoff periods.

Vegetation along City Creek and Emigration Creek (from the point of spill to the Salt Lake City residential areas) would be affected. Vegetation along the West Fork of the Duchesne River and Provo River would be affected from the point of spill to an unestimated number of miles downstream. Due to the large quantity of the potential oil spills and the small water surface areas involved, oil concentrations in the water would be expected to remain high for considerable downstream distances.

Soils along the Provo River, Emigration Creek, and City Creek crossing are silt loams, silty clays, heavy loams, and clay loams. The clay content of the soil could hold the oil tightly and flushing with water would not remove the oil; repeated water flushings could cause the soil to become impermeable (American Petroleum Institute et. al., 1977). Natural reestablishment of riparian vegetation on these soils would be slow, requiring more than one or two seasons.

Soils along the West Fork of Duchesne River are sandy. The large quantity of the potential oil spill and relatively small water surface area would permit penetration of the oil into the soils on the riverbanks. Penetration of light-weight oils in sand have been known to reach depths of 15 feet plus (American Petroleum Institute, et. al., 1977, p.259). The potential natural cleaning action of water fluctuations in the sandy soils associated with this river would not allow for a prompt re-invasion of riparian species, i.e., more than two years would be required for reestablishment of riparian vegetation to near original conditions.

Stream channel widths vary from approximately 25 feet at City Creek and Emigration Creek to 75 feet at the West Fork of Duchesne River. The low viscosity of the shale oil indicates a lower probability of deposition on the channel bottoms and adsorption on suspended particulate matter. Such

particulate matter usually forms sludge on the streambed and banks (Winget 1979). If the water velocities are sufficient, large quantities of the oil would be flushed through the stream and river systems, allowing little time for it to be adsorbed or settled on the substrate.

Land Areas

Vegetation

The worst case landspill for vegetation resources would occur in the Wolf Creek Pass area from milepost 99 to 102 (division between the Wolf Creek and West Fork Duchesne watersheds). The combination of broken topography, long steep slopes, and numerous small drainages would increase the ground surface area affected. Poor transportation access would cause difficulty in cleanup and restoration measures.

Vegetation in the area in question consists of grass, forb, brush, and tree species occupying continuous belts and/or occurring in isolated patches. Several meadow like areas also exist. Oil-covered, low-lying vegetation would be killed; and the linear and lateral extent of the kill could range from several hundred feet to 1,000 feet, depending on the terrain features. A reduction in growth and loss of foliage would occur to large brush and tree species.

Oil concentrations in the silt loam and silty clay soils would be confined to the upper soil profile, and impacts to deeply rooted plants would be minimal. Successful reestablishment of grasses, forbs, and brush would depend on natural bacterial degradation of the oil and/or implementation of soil reconditioning measures, i.e., cultivation and application of manure.

Soil

The worst case landspill for soil would occur in the Kamas Valley area between mileposts 112 and 122. The season of worst impacts would be between early and late winter when ground cover would be at a minimum, i.e., when crops were not present to impede spread of oil. The soils are shallow with a large percentage of coarse fragments in the soil profile. Any physical removal of oil-laden soil would adversely affect the value of the soil as a plant growing medium, i.e., the soil profiles supporting plant growth would be lost or the soil depths needed for proper plant growth would be reduced. Clean-up of residual oil by burning would require cultivation following the burn to break up the crust formed and to aerate the soil, enabling biological degradation of remaining oil (American Petroleum Institute, et. al., 1977, p. 94). Cultivation would bring the coarse fragments to the surface which would also reduce the value of the soil as a plant growing medium.

The quantities of potential oil spill (5,200 barrels) would cover approximately 5 to 10 acres, 1 inch deep in the Kamas area. Studies done by Conoco Oil Company show that "... paraffinic oils mixed into the upper 6 inches of topsoil to a concentration of 5 percent would degrade at a rate of only about 60 barrels of oil per acre per year (American Petroleum Institute, et. al., 1977, p. 482). Such studies indicate that residual shale oil in the Kamas Valley soils on 5 to 10 acres would require up to 9 years to degrade.

A.5 WILDLIFE

General Impacts

Terrestrial Wildlife

Impacts to wildlife and habitat losses from land spills would be variable and dependent on specific situations at the site and time of a possible spill. Examples of variables would include magnitude or volume of the oil spill, species present in the immediate area, season of spill, mobility of species present, portions of the habitat utilized (e.g., prairie dogs as compared to deer), and surface conditions at the spill site (i.e., moisture, soil type, etc.).

Aquatic Wildlife

Oil in the aquatic environment would create wildlife problems more significant in magnitude than those expected from comparable land spills. Although the chemical and/or toxicological effects of oil in the aquatic environment are widely known, they are probably equalled and, in many cases, surpassed by the "mechanical" effects and related interactions with various aspects of the habitat. It has been shown that direct contact by fish with crude oil resulted in death caused by a film over the gill filaments (Wiebe 1938). Free oil and emulsions may act on the epithelial surfaces of fish gills and interfere with respiration. They may coat and destroy algae and other plankton thereby removing a source of fish food, and when ingested by fish they may taint their flesh. Oil films, upon contacting other substances and materials, may settle and coat the bottom, destroying benthic organisms and interfering with spawning areas. Oil, when deposited on the bottom, may continuously yield water-soluble substances that are toxic to aquatic life. Surface films of oil may interfere with reaeration and photo-synthesis and prevent the respiration of aquatic insects, both larval and adult forms. It should be pointed out that little is known concerning the specific nature of potential synfuel pipeline products and their impacts and interactions in the aquatic environment. The above comments are concerning oil in general and observations that deal with conventional petroleum products and crude oil forms.

Impacts due to toxicity depend on the availability of various petro-

chemicals in the pipeline product, and the related solubility in water from the product. Standard bioassays (Pickering and Henderson 1966) have been conducted, for example, with benzene, clorobenzene, O-chlorophenol, 3-cloropropene, O-cresol, cyclohexane, ethyl benzene, isoprene, methyl metacrylate, phenol, O-phthalic anhydride, styrene, toluene, vinyl acetate, and xylene (Federal Water Pollution Control Administration 1968). These chemicals when tested in solution produced 96-hour TLm values (death to 50 percent of the test animals) ranging from 12 to 368 mg./1/ (or parts per million). As a general summary statement on the impacts of an oil spill in the aquatic environment, it could be stated as follows: Oil may injure aquatic life by direct contact with the organism, by poisoning with various water soluble substances that may be leached from the spilled oil, or by

emulsions of oil which may smear the gills or be swallowed with water and food. A heavy oil film on the water surface may interfere with the exchange of gases and respiration.

Specific Impacts

Stream Crossings

White River (MP-6.7) - Slow flowing and meandering waters generally turbid with sediments. Expected impacts could include additional losses and stress to the already threatened fish species discussed in the Threatened and Endangered Wildlife section of this report. Losses would also occur to numerous other waterfowl, shorebirds, and water-oriented wildlife forms. (See discussion below concerning wildlife refuge impacts.) A pipeline break beneath or adjacent to the river would impact waters and the bed and banks for many miles downstream, depending on the magnitude and duration of the spill.

Green River (MP-20) - Same as discussion for White River, above.

West Fork Duchesne River (MP-91) - A pipeline break and/or resultant oil spill at this crossing would result in considerable loss to cold water game fish and the supporting streambottom flora and fauna, including numerous beneficial and valuable macroinvertebrate forms. The stream that would be impacted at this crossing and for a number of miles downstream is more typically a clear cold-water mountain trout stream, steeper in gradient (2 % +) and with numerous pools and riffles. The stream is popular with anglers and produces mostly cutthroat and rainbow trout and mountain whitefish.

South Fork Provo River (MP-107) - See discussion under West Fork Duchesne River above.

Emigration Creek (MP-144) - A small popular mountain trout stream adjacent to a large population center. Cold water trout habitat with steeper gradients in excess of 3 percent and numerous pools and riffles. Expected impacts here would be similar to those in the West Fork Duchesne and South Fork Provo River. Bottom gravels (spawning) and rubble (macroinvertebrate production) would be blanketed and production lost. (See also discussion under General Impacts Aquatic Wildlife.)

City Creek (MP-154) - See discussion under Emigration Creek above.

Land areas

A "worst case" scenario for a pipe rupture and resultant oil loss in a land area along the proposed pipeline corridor would undoubtedly involve the Ouray National Wildlife Refuge. Particularly, if oil were lost into any marshy or ponded areas on the refuge the problem would be compounded. Most serious losses (again depending on the season of impact) would be with waterfowl and other shorebirds and other aquatic and riparian-oriented species. Waterbirds, muskrats, mink, and many other wildlife species are dependent on water based food and prey species. Studies have demonstrated (Hartung 1965) that egg laying was inhibited when waterfowl ingested small quantities of oil. When

oil from the plumage was coated on mallard eggs, it reduced hatching from 80 to 21 percent. The full significance of this type of damage to wildlife populations is unknown. Dramatic losses of waterbirds (ducks, geese, swans, coots, and others) result from the coating of their plumage from the surface of oil contaminated waters. Once the bird's plumage is soaked with oil, the bird loses its natural insulation from the cold and dies. Many hundreds of thousands of birds have died from oil pollution in United States waters in recent years.

Oil that settles to the bottom of aquatic habitats can blanket large areas and destroy the plants and animals of value to feeding waterfowl.

Some oil sludges on the bottoms of aquatic habitats tend to concentrate pesticides, thus creating a double hazard to waterfowl that would pick up these contaminants in their normal feeding process.

A.6 AGRICULTURE

A. General Impacts

(Refer to VEGETATION, SOILS, AND RECLAMATION)

B. Specific Impacts

Cropland

This spill analysis considers a loss of 5,200 barrels of shale oil on the irrigated cropland of Kamas Valley between mileposts 112 and 122. This area would experience greater impacts than other cropland areas due to the long-term affects to the soil profile (See Vegetation, Soils, and Reclamation, B.). The cropland areas in the Duchesne River Valley and Parley's Park Area occupy deep soils where soil reconditioning measures would be easier to apply, and the results of such measures would be favorable to improved cropland production.

Estimated acre yields of alfalfa and meadow hay in the Kamas Valley area range from 2.4 to 3.5 tons per acre (Harvey 1982). Based on the spill covering 5 to 10 acres, 12 to 35 tons of alfalfa and meadow hay could be lost during or following a spill. The yield production potentials for these acres following a spill would be affected on a long-term basis (9 years plus). A return to original production rates would depend on the success of oil removing measures and minimizing disturbances to the shallow soil profiles.

Grazing Land

A shale oil spill of 4,400 barrels in the Uinta Mountain and Plateau area between milepost 95 and 99 would have the potential of affecting from 5 to 20 acres of the Uinta National Forest West Fork Cattle Allotment. (Refer to Vegetation, Soils, and Reclamation, for the physiographic description of the land area that would be affected.) Average carrying capacity for livestock in this allotment has been set at 3.2 acres per animal unit month (Smith 1982). Therefore, forage lost would support from 1.6 to 6.3 cattle for 1 month per

year. Such losses would continue until forage species were successfully reestablished. Oil spill cleanup and soil reconditioning activities would require several years to complete, due to difficult terrain features and transportation access problems. Reestablishment of forage species would follow these activities, and several years could be required for successful revegetation of the species. The above discussion indicates a potential loss of forage for at least a 5-year period.

A.7 TRANSPORTATION NETWORKS

It is not expected that an oil spill would affect any of the transportation systems except under rare circumstances. A spill at any of the following crossings could conceivably be a threat to public safety because of the flammability of the oil:

MP 41 U.S. Highway 40
MP 128 U.S. Highway 189
MP 139 Interstate 80
MP 157 Interstate 15
MP 157 D & DGW Railroad
MP 157 Union Pacific Railroad

A.8 RECREATION

General Impacts

Impacts to the recreation resource and users due to either a land spill or river crossing would generally be short-term and temporary (1 to 2 years). Public opinion and sentiment would be strong should a land spill affect the Pioneer Monument State Park. Impacts on sightseeing, visual, and historic values would be adversely significant on a temporary basis. An oil spill within the Green River would also be adversely significant due to the effects upon deer and waterfowl hunting along the river drainage and nature study opportunities within the Ouray National Wildlife Refuge. An oil spill on the Duchesne River within the Uintah and Ouray Indian Reservations would likely adversely affect fishery values on a short-term basis and create strong public opinion and sentiment, particularly from the Ute Indian Tribe who are dependent on fishing permits as a portion of their economic base.

Specific Impacts

River and Stream Crossings

White River

In the event of an oil pipeline rupture and spill of about 718 barrels as described in the vegetation and water resources section, impacts to the recreation resource and users of the White River at milepost 6.7 would be temporary and generally considered minimal. Natural, cultural, and recreational values as related to the identification of the White River as a potential candidate for inclusion into the National Wild and Scenic Rivers program would not be permanently impaired and, therefore, would not foreclose

this possible future classification. That portion of the oil spill that would adhere to the canyon river banks and riparian vegetation at the specified flow rate would within 1 to 2 years dissipate due to subsequent higher spring flows when river running is at its peak use. This would result in no long term visual or sensory impacts upon the quality of the river recreation experiences.

Short-term impacts (approximately 1 to 2 years) could possibly affect the quality of hunting and fishing experiences for those sportsmen who recreate along the river from the rupture site to the confluence with the Green River. The sight and possibly the odor of oil along the river banks would likely offend sportsmen who hunt for waterfowl and small game animals and channel catfish fishermen along this segment of the river. Again, by late spring when the river flow reaches its peak, the impact would be minimized.

Green River

In the event of an oil pipeline rupture and spill of the approximate magnitude of 990 barrels of oil at milepost 20.4, impacts to the recreation resource and users of the Green River would be temporary. Natural, cultural, and recreational values related to the identification of the Green River as a potential candidate for inclusion into the National Wild and Scenic Rivers program would not be permanently impaired, and therefore would not foreclose this possible future classification. That portion of the oil spill that would adhere to the meandering river banks and riparian habitat at the specified flow rate would within 2 years dissipate due to subsequent higher spring flows.

Short-term impacts (approximately 1 to 2 years) would likely be significant and create high public controversy and opinions since the rupture and oil spill contaminants would be most acutely noted within the boundary of the Ouray National Wildlife Refuge. Both comsumptive (waterfowl and mule deer hunting and fishing) and nonconsumptive (nature study and sightseeing) forms of recreation along the Green River would be adversely impacted. The visual and sensory impacts of oil along the river banks and riparian vegetation would for two hunting seasons diminish hunting quality where waterfowl and big game species are at their highest concentrations. Fishing quality, primarily for channel catfish, would also diminish due to the visibility of oil along the meandering banks of the Green River. Of greater concern would be the adverse impacts upon the quality of the sightseeing and nature study experiences. The sights and possible odor of an oil spill, particularly within an established protective reserve as the Ouray National Wildlife Refuge, would be viewed as extremely offensive to these recreationists. However, in all cases, within 2 years when the Green River flow reaches its peak twice, this impact would be expected to be negligible.

West Fork of the Duchesne River

In the event of an oil pipeline rupture and spill of the approximate magnitude of 7,550 barrels of oil at milepost 90 at the crossing of the West Fork of the Duchesne River, impacts to recreational fishing values would be significant. Fishing opportunities downstream from the spill would be adversely impacted

for up to approximately 4 years based on the quantity of oil spill and the time needed for the Duchesne River to return to a productive fishery.

South Fork of the Provo River

For a similar analysis of recreational fishery value impacts due to an oil pipeline rupture and spill of the approximate magnitude of 3,490 barrels of oil at the south fork crossing of the Provo River at milepost 107, refer to the preceding impact analysis for the West Fork of the Duchesne River.

Emigration Creek

For a similar analysis of recreational fishery value impacts due to an oil pipeline rupture and spill at Emigration Creek at milepost 144, refer to the preceding impact analysis for the West Fork of the Duchesne River.

City Creek

No recreation, water-oriented impacts would occur; however, it is possible that recreation day use could be affected by damage to lawns in Memory Park which may occur should the oil spread out near the mouth of City Creek Canyon.

Land Spill

In the event of an oil pipeline rupture and spill of the approximate magnitude of 2,800 barrels of oil at milepost 150, impacts to the recreation resource and users of the Pioner Monument State Park would be significant due to the adverse public sentiment and opinion that would result. At milepost 150, the alternative product pipeline would be sited approximately 1/4 mile north and upslope from the park's northern boundary. Several significant historic sites within the state park would be adversely impacted from an oil spill including, "This is the Place Monument"; the park's visitor center; "The Old Desert Village," a re-creation of a typical Mormon settlement during the mid-1800's; the restored Brigham Young Farm House; a portion of the Mormon Pioneer National Historic Trail; and various sightseeing roadways. Irreparable damage to the historic Brigham Young Forest Farm Home could occur. Sightseeing opportunities within that portion of the state park affected by the oil spill would have to be temporarily (4-8 weeks) curtailed until cleanup procedures were completed. Cleanup outside and adjacent to the park boundary would likely entail burning off the excess oil which would have visually adverse impacts upon park visitors for likely up to two summers tourist seasons, or until revegetation was completed.

A.10 CULTURAL RESOURCES

General and Specific Impacts

Stream Crossings

There would be no effect to cultural resources if the spills were confined to the stream beds. All known sites along the pipeline route are above ground and are outside of stream beds.

In the City Creek Canyon Historic District (MP 154), the buildings in the surrounding area constitute the historic site. These buildings would be affected by an oil spill if the oil overflowed the creek banks and covered portions of structures adjacent to the creek. The structures could be disturbed or damaged during clean-up activities.

Occurrences as described for the City Creek Canyon Historic District would similarly affect cultural resource sites located adjacent to any impacted stream course. Sites receiving the most long-lasting and detrimental impacts from oil overflowing a creek bank would be those having values lying close to the ground surface. Such values would be displaced or destroyed during clean-up activities. There are no stream courses along the pipeline route that exhibit a high concentration of known sites immediately adjacent to the stream banks.

Land Areas

Most of National Register sites along the pipeline route are located between milepost 145 and 157. The majority of the sites in this area are buildings, and oil spill damage would most likely be structural in nature. The values of these sites contributing to the educational and cultural interest qualities of the Salt lake City area could be either destroyed or reduced. Effects would be long-lasting unless organized clean-up activities were initiated and properly directed immediately after a spill. See the recreation section for description of potential impacts to historical sites at Pioneer Monument State Park.

A.11 VISUAL RESOURCES

General Impacts

Hydrotreated shale oil is a yellowish, light brown, translucent material (as contrasted to raw shale oil which is black and opaque). Visual resource impacts from spilled hydrotreated shale oil itself generally are not expected to be of great consequence as the translucent color would blend with the general earth tones.

Visual impacts of most concern would be those associated with the spilled oil as it may accumulate dirt, litter, or debris and as it may result in dead plants or animal life.

Specific Impacts

Stream Crossings

Visual impacts would occur primarily in spots of oil concentration. These would include the river area in the immediate vicinity of the spill and also downstream slow currents or eddies. The oil concentrations and accumulated debris and dead material would present an unsightly condition.

Land Areas

Visual impacts related to land spills would be moderately noticeable for a short period of time. As the oil was cleaned up and/or as it weathered and

degraded, the visual impact would be minor or disappear. Dead vegetation, if any, remaining from the effects of the spill would extend the visual condition beyond the period apparent by the oil itself.

A.13 EXISTING LAND USE PLANS

General Impacts

Land uses associated with the supply of domestic water to the Salt Lake Valley area and with residential and business developments along the Salt Lake City foothill area would experience significant impacts from shale oil spills. These land uses are directly tied to the quality of life for numerous individuals and the proper functioning of the business and industrial communities of the valley area. Potential for oil spill would likely not have a permanent effect on the land uses along the pipeline route; however, short term consequences would be present should any particular spill occur. (Also see discussion of socio-economics.)

Specific Impacts

Stream Crossings

The area where land uses would be most affected by a stream crossing oil spill would be at Parley's Summit (Alexander Creek). A 4,000-barrel oil spill near milepost 139 would severely impact Mountain Dell Reservoir. In 1981, this reservoir provided 8.5 percent of the consumed water in the Salt Lake City water distribution system (Bradshaw 1982). On a per day basis for 1981, the reservoir provided an average of 6.7 percent of the consumed water; the maximum water ever supplied to the distribution system during 1981 represented 29 percent of the total system water (Bradshaw 1982).

A recent oil contamination of the reservoir (originating at a nearby state highway maintenance yard) required 1 to 3 days of cleanup by skimming and boom control. The oil contamination was estimated to equal a 50- to 55-barrel spill (Lee 1982). Some of the oil mixed with the water and entered the water treatment facility below the dam. Extensive water treatment measures were required to remove the water soluble and insoluble oil components (Lee 1982). According to the Mountain Dell Reservoir supervisor, an oil spill of the magnitude addressed by this report would require drainage of the reservoir and cleaning and reconditioning of the reservoir bottom; this would put the reservoir out of operation for a 1 to 2 year period (Lee 1982). The loss of the reservoir operation would require drawdowns of other water producing areas making up the distribution system. Some water shortages would occur, especially during drought years.

The tolerable health concentrations for petroleum derived substances in water far exceed the limits of taste and odor. Since petroleum derivatives become objectionable at concentrations far below the human chronic toxicity, it appears that hazards to humans would not result from drinking oil-polluted reservoir water (EPA 1976).

Land Area

The worst-case spill on a land area would be the loss of 2,800 barrels of shale oil within municipal development areas of Salt Lake City between mileposts 148 and 152. The "Avenues" residential area, business buildings, University of Utah (including the Medical Center), and the Fort Douglas facilities would all have the potential of being affected by a single point rupture and resulting spill.

The above mentioned areas and facilities are located downhill from the pipeline corridor route. The route, as well as the municipal areas and facilities, are located on slope gradients ranging from 5 to 20 percent. The low viscosity of the oil and sloping terrain would cause the oil to spread rapidly over a large portion of the areas mentioned. Facilities along the oil flow would be covered with oil, and low-lying landscaping vegetation would be killed. The movement of people in the oil spill area would be stopped or slowed down. The potential would exist for the oil to enter underground water drainage systems by way of street gutters and to eventually show up in portions of the downtown city area.

A major operation would be required to remove oil contaminated vegetation and to clean up the contaminated facilities. This operation would probably require a full year to complete, particularly if replacement of structures and landscaping would be involved. Public controversy over a spill would linger for years.

A.14 MITIGATION AND MONITORING

State Spills Directory

The State of Utah and Federal Agencies would require adherence to the latest State of Utah Oil and Hazardous Spills Directory.

Federal Requirements

On Federal lands the applicant would be required to prepare a spill prevention, control, and counter measure plan (SCCP) prior to receiving permitting authorizations for construction and operation of the shale oil pipeline. The plan would specify notification of appropriate agency personnel and actions that would be taken to detect and stop oil spills, methods of collection and removal of the oil, and followup treatment of residual oil in the environment. This plan would be subject to the approval of all concerned Federal, State, and local agencies and governing groups.

The plan would be required to include state-of-the-art techniques to be utilized for control and clean-up of spills. The following are examples of techniques that could be employed:

Containment

Containment may be by use of booms on designated water courses (open waters and lakes and rivers and large streams), by use of siphon dams or

filter fences on designated water courses (small streams and drainage ditches), or by the use of containment dikes and areas of impervious material on key land use areas.

Removal

Physical oil removal from the environment may be by suction, mechanical skimmer, sorbents, or incineration (or a combination of these) on water courses. These same methods may be used on land use areas, combined with stripping of contaminated soil and recovery wells, trenches, ditches, and biodegradation.

Disposal

Disposal of oil spill residues and contaminated materials and debris (for small quantities of oil saturated soil or sorbent material) may be by burning, burial in sanitary landfills, tilling into soil for natural biodegradation, or by disposal in a location where (1) there would be no danger of pollution to any water, (2) adequate soil conditions would prevent rapid leachate percolation into groundwater, (3) no surface water flooding or severe erosion would occur, (4) undisturbed soils would exist to provide at least a 10-foot vertical separation between the high water table and the base of the earth seal, and (5) no previously placed refuse layers would exist.

The use, design and deployment of the above techniques would be specified by water course and land use area in the SCCP.

Containment, removal, and disposal techniques would require prior approval and authorization of the land management agency.

The SCCP would require that a thorough and precise monitoring program be developed to detect oil losses from the pipeline on a near instantaneous basis. The requirements of the monitoring program would be dependent on what may be determined to be a realistic acceptable risk which may be associated with a maximum oil spill. This would vary by geographic area and potential impacts.

Uncommitted measures that may be considered for implementation by permitting agencies and groups.

a. Use of sensitive pressure gauges (if possible, sensitive to 0.1 psi) at each pumping station and the refinery areas near Salt Lake City.

b. A means to check flow quantity, e.g., a precision flow meter at both the Sand Wash site and at the Salt Lake refinery area or a means to accurately account for storage tank volume changes at each end of the pipeline.

c. Continuous monitoring and an automatic alarm system for any change from normal operation.

d. Design and utilization of automatic valves in place of manually controlled shutoff valves.

e. Replacement of fish and/or wildlife lost due to oil spills (i.e., trout populations that could be restocked from hatchery sources), and/or compensation to wildlife agencies for replacement of fish or animals and appropriate expenses related to their transport and restoration.

f. Replacement of selected vegetation, ditches, soil, or other features damaged by the spill and/or disturbed during cleanup.

APPENDIX B

LAND OWNERSHIP AND LAND USES

Table B-1

Land Ownership by Milepost

Plant Site to Salt Lake City Refinery

M.P.	Ownership[a]	Miles	Feet	County
0 - 2.0	S	2.0	10,560	Uintah
2.0 - 6.4	I	4.4	23,232	Uintah
6.4 - 6.8	P	0.4	2,112	Uintah
6.8 - 7.1	I	0.3	1,584	Uintah
7.1 - 7.8	P	0.7	3,696	Uintah
7.8 - 9.8	I	2.0	10,560	Uintah
9.8 - 11.5	I	1.7	8,976	Uintah
11.5 - 12.1	P	0.6	3,168	Uintah
12.1 - 12.6	I	0.5	2,640	Uintah
12.6 - 13.4	P	0.8	4,224	Uintah
13.4 - 18.2	I	4.8	25,344	Uintah
18.2 - 19.2	FWS	1.0	5,280	Uintah
19.2 - 20.6	I (leased to FWS by Ute Indians)	1.4	7,392	Uintah
20.6 - 21.1	FWS	0.5	2,640	Uintah
21.1 - 22.3	BLM	1.2	6,336	Uintah
22.3 - 23.2	P	0.9	4,752	Uintah
23.2 - 24.1	BLM	0.9	4,752	Uintah
24.1 - 26.1	I	2.0	10,560	Uintah
26.1 - 26.5	P	0.4	2,112	Uintah
26.5 - 27.1	I	0.6	3,168	Uintah
27.1 - 28.2	P	1.1	5,808	Uintah
28.2 - 28.6	I	0.4	2,112	Uintah
28.6 - 34.4	P	5.8	30,624	Uintah
34.4 - 38.6	I	4.2	22,176	Uintah
38.6 - 38.8	P	0.2	1,056	Uintah
38.8 - 40.4	P	1.6	8,448	Duchesne
40.4 - 41.9	I	1.5	7,920	Duchesne
41.9 - 47.2	P	5.3	27,984	Duchesne
47.2 - 47.5	I	0.3	1,584	Duchesne
47.5 - 47.9	P	0.4	2,112	Duchesne
47.9 - 49.2	I	1.3	6,864	Duchesne
49.2 - 66.9	P	17.7	93,456	Duchesne
66.9 - 67.1	I	0.2	1,056	Duchesne
67.1 - 67.5	IA	0.4	2,112	Duchesne
67.5 - 67.7	I	0.2	1,056	Duchesne
67.7 - 67.9	P	0.2	1,056	Duchesne
67.9 - 68.4	I	0.5	2,640	Duchesne

Table B-1 (cont'd)

M.P.	Ownership	Miles	Feet	County
68.4 - 68.5	IA	0.1	528	Duchesne
68.5 - 75.9	P	7.4	39,072	Duchesne
75.9 - 76.2	I	0.3	1,584	Duchesne
76.2 - 77.9	P	1.7	8,976	Duchesne
77.9 - 78.2	IA	0.3	1,584	Duchesne
78.2 - 78.3	P	0.1	528	Duchesne
78.3 - 78.6	I	0.3	1,584	Duchesne
78.6 - 78.9	IA	0.3	1,584	Duchesne
78.9 - 79.7	I	0.8	4,224	Duchesne
79.7 - 79.9	P	0.2	1,056	Duchesne
79.9 - 80.5	I	0.6	3,168	Duchesne
80.5 - 80.9	P	0.4	2,112	Duchesne
80.9 - 81.2	IA	0.3	1,584	Duchesne
81.2 - 81.9	P	0.7	3,693	Duchesne
81.9 - 82.0	I	0.1	528	Duchesne
82.0 - 82.4	P	0.4	2,112	Duchesne
82.4 - 82.7	I	0.3	1,584	Duchesne
82.7 - 83.9	P	1.2	6,336	Duchesne
83.9 - 84.3	I	0.4	2,112	Duchesne
84.3 - 84.4	P	0.1	528	Duchesne
84.4 - 84.7	I	0.3	1,584	Duchesne
84.7 - 94.9	P	10.2	53,856	Duchesne
94.9 - 95.4	P	0.5	2,640	Wasatch
95.4 - 109.0	FS	13.6	71,808	Wasatch
109.0 - 109.9	P	0.9	4,752	Wasatch
109.9 - 110.9	P	1.0	5,280	Summit
110.9 - 112.3	P	1.4	7,392	Wasatch
112.3 - 112.6	FS	0.3	1,584	Wasatch
112.6 - 115.4	P	2.8	14,784	Wasatch
115.4 - 125.5	P	10.1	53,328	Summit
125.5 - 127.9	P	2.4	12,672	Wasatch
127.9 - 138.4	P	10.5	55,440	Summit
138.4 - 139.4	FS	1.0	5,280	Salt Lake
139.4 - 143.2	P	3.8	20,064	Salt Lake
143.2 - 143.8	FS	0.6	3,168	Salt Lake
143.8 - 147.4	P	3.6	19,008	Salt Lake
147.4 - 148.1	FS	0.7	3,693	Salt Lake
148.1 - 152.3	P	4.2	22,176	Salt Lake
152.3 - 152.7	FS	0.4	2,112	Salt Lake
152.7 - 152.9	P	0.2	1,056	Salt Lake
152.9 - 153.3	FS	0.4	2,112	Salt Lake
153.3 - 155.1	P	1.8	9,504	Salt Lake
155.1 - 155.8	FS	0.7	3,693	Salt Lake
155.8 - 156.9	P	1.1	5,808	Salt Lake

Table B-1 (cont'd)

M.P.	Ownership	Miles	Feet	County
156.9 - 160.0	P	3.1	16,368	Refinery Area
		160.0 Miles		

[a] BLM = Bureau of Land Management
FS = Forest Service
I = Indian Tribal Lands
IA = Indian Allotted Lands
P = Private
S = State
FWS = U.S. Fish and Wildlife Service

(Ownership designation based on major ownership pattern within the 1-mile wide study area.)

Source: Uinta National Forest Map 1975
Wasatch National Forest Map 1976
BLM Land Status Maps
Uintah & Ouray Indian Reservation Maps 1979
(Land ownership and highway maps)

Table B-2

Land Uses

Table B-2 depicts those known land uses, their locations, and comments within the 1-mile wide study corridor for the alternative product pipeline.

Land Use	Location	Comments
Grazing	MP 0 - 9.8	State and Uintah & Ouray Indian Reservation
	21 - 22	Uintah & Ouray Indian Reservation
	36 - 40	Uintah & Ouray Indian Reservation
	67 - 95	Indian Allotted lands (Duchesne River Valley)
	95 - 109	Uinta National Forest
	122 - 132	Parley's Park
Transportation Corridors	MP 63 - 94	State Highway 35
	95 - 109	Proposed utility corridor (U.S. Forest Service)
	110 - 120	State Highway 35 & U.S. Highway 189
	133 - 139	Interstate 80
	144 - 149	Proposed utility corridor (U.S. Forest Service)
Domestic Watershed	MP 138 - 150.1	Parley's Summit to Red Butte Canyon
	155 - 157	
Cropland (irrigated-non-irrigated)	Duchesne River Valley	Of the 34 miles in the Duchesne River Valley, approximately 6 miles would be located on Indian Allotted lands.
	Kamas Valley Area Parley's Park	
Residential (Urban-Rural)	Utahn	Rural
	Tabiona	Rural
	Hanna	Rural
	Woodland	Rural
	Frances	Rural
	Parley's Park	Summer Homes and Permanent Residences
	Emigration Canyon to Dry Creek	Urban

Source: BLM/FS Study Team, Salt Lake City Alternative Product Pipeline, 1982

APPENDIX C

STREAM CROSSINGS

Table C-1

List of Stream Crossings

Nearest M.P.	Stream Name	County	Flow[a] I/P	State[b] Stream Class.	Habitat[c] Value Class.	State Water[d] Quality Stds.
6.7	White River	Uintah	P	4X	VH (T&E)	3C-4
7.8	Red Wash	Uintah	I			
12	Trib. to White River	Uintah	I			
20	Green River	Uintah	P	4X	VH (T&E)	
26	Duchesne River	Uintah	P	4X	VH (T&E)	1C-3B-4
38	Trib. to Duchesne	Uintah	I			
43	Trib to Duchesne	Duchesne	I			
44	Pleasant Valley Canal	Duchesne	P			
47	Gray Mountain Canal	Duchesne	P			
48	Duchesne River	Duchesne	P	4X	VH (T&E)	1C-3B-4
51	Duchesne Feeder Canal	Duchesne	P			
58	Knight Ditch	Duchesne	P			
59	Knight Ditch	Duchesne	P			
62	Benson Draw	Duchesne	I			
66	Pioneer Canal	Duchesne	P			
68	Rock Creek	Duchesne	P	3	VH	
71	Duchesne River	Duchesne	P	3	VH	1C-3A-4
74	Duchesne River	Duchesne	P	3	VH	1C-3A-4
75	Wagstaff Hollow	Duchesne	I			
84	Right Fork - Farm Creek	Duchesne	P			

Table C-1 (cont'd)

Nearest M.P.	Stream Name	County	Flow I/P	State Stream Class.	Habitat Value Class.	State Water Quality Stds.
86	Squaw Creek	Duchesne	I	UNK		
87	Duchesne River	Duchesne	P	2R	VH	
88	Blind Stream	Duchesne	P	UNK		
90	Duchesne River	Duchesne	P	2R	VH	1C-3A-4
90	Rhoades Canal	Duchesne	P			
91	West Fork Duchesne River (3)	Duchesne e	P	3B	VH	1C-3A-4
92	Spring Creek	e	P	UNK	H	
92	West Fork Duchesne River (2)	e Duchesne	P	3B	VH	1C-3A-4
94	Wolf Creek	Duchesne	P	3N	VH	1C-3A-4
100	Wolf Creek	Duchesne	P	3N	H	1C-3A-4
105	South Fork Provo River	Wasatch	P	3	H	1C-2B-3A-4
107	South Fork Provo River	Wasatch	P	3	H	1C-2B-3A-4
110	Provo River	Wasatch	P	2	VH	1C-2B-3A-4
111	Provo River	Wasatch	P	2	VH	1C-2B-3A-4
120	Provo River	Wasatch	P	2	VH	1C-2B-3A-4
121	Weber-Provo Canal	Summit	P	4		
123	City Creek	Summit	I			
127	Indian Hollow	Summit	I			
129	Ross Creek	Wasatch	I			
132	Silver Creek	Wasatch	P	4	H	
135	Kimbal Creek	Wasatch	P	3	M	

Table C-1 (cont'd)

Nearest M.P.	Stream Name	County	Flow I/P	State Stream Class.	Habitat Value Class.	State Water Quality Stds.
136	Three Mile Creek	Wasatch	I	UNK		
137	Two Mile Creek	Wasatch	I	UNK		
139	Toll Creek	Wasatch	I	3B		
141	Parley's Creek	Salt Lake	I			1C-3A
142	Alexander Creek	Salt Lake	I			
143	Mountain Dell	Salt Lake	P	H		1C-3A
145	Emigration	Salt Lake	P	4	H	3A
146	Pioneer Fork Creek	Salt Lake	I			
147	Cederloff Creek	Salt Lake	I			
150	Red Butte	Salt Lake	P	3	H	1C-3A
151	Dry Creek	Salt Lake	I			
154	City Creek	Salt Lake	P	4	H	1C-3A

a/ I = Intermittent
P = Perrenial

b/ (See attachment C-2)

c/ VH = Very High
H = High
M = Moderate
(T&E) = Threatened and Endangered

d/ (See attachment C-3)

e/ Multiple crossings

Source: USDA, Forest Service, Wasatch National Forest, Chuck Madsen - Civil Engineer, 1982.

ATTACHMENT C-2

A Brief Description of the System Used to Classify Fishing Waters in Utah

Fisheries habitat in Utah is being inventoried and classified on a statewide basis by the Utah Division of Wildlife Resources (UDWR) to aid in their management decisions. This type information is also extremely valuable and is in great demand by various government and public agencies. These are the decision makers who determine the fate of various land and water proposals, and also, what provisions will be instituted to preserve wildlife habitat. Another use that likely will become more important with the publication of this atlas is by the fishing public. The rating system should prove to be helpful in planning fishing trips and other forms of recreation.

An important feature of any good inventory and classification system is that it provides current and accurate information. To accomplish this, the UDWR has recently computerized the data. This makes it possible to update the information from field data which are continually being collected and improved. It also makes it possible to print out the data in various forms to accommodate various needs and uses. Below is a brief summary of the habitat inventory and classification system used to categorize the fishery and current totals by class, as available May 15, 1979.

In addition to a physical inventory, each lake or stream section is rated using three criteria--esthetics, availability, and productivity. A numerical value on a scale of one to five is determined for each of the above criteria. The value of esthetics is then multiplied by a factor of one, the value of availability by two, and the value of productivity by four. The sum of these scores is the numerical rating of the lake or stream section.

Based on this numberical rating, Utah fishing waters are placed in classes as indicated below:

Class	Numerical Rating
1	31-35
2	25-30
3	18-24
4	11-17
5	7-10
6	Dewatered

General Definitions of Class 1, 2, 3, 4, 5, and 6 Streams

Class 1 streams are the top quality fishing waters of the state. They should be preserved and improved for fishery and similar recreational uses. These streams are generally outstanding in natural beauty and of a unique type. They are accessible by modern car at suitable points, and larger waters are floatable with suitable launching facilities. Productivity is such that it

supports high fish populations in good condition of one or more species of the more desirable game fish. Natural reproduction or the stocking of small fish maintains an excellent sport fishery. At the present time, there are only 67 miles of Class 1 stream in Utah.

Class 2 waters are of great importance to the state fishery. These are productive streams with high esthetic value and should be preserved. Fishing and other recreational uses should be the primary consideration. They are moderate to large in size and may have some human development, such as farms or commercial establishments, along them. Many Class 2 streams are comparable to Class 1 except for size. At the present time, there are only 320 miles of Class 2 stream in Utah.

Class 3 streams comprise approximately half of the total stream fishery habitat in Utah. These waters are important because they support the bulk of stream fishing pressure in Utah. Water developments involving Class 3 waters should be planned to include fisheries as a primary use, and fishery losses should be minimized and enhanced when possible. There are 3,016 miles of Class 3 stream in Utah.

Class 4 streams are typically poor in quality with limited fishery value. Fishing should be considered a secondary use. A few Class 4 waters provide an important catchable fishery in areas where no other fishery exists. Water development plans should include proposals to enhance fisheries values where feasible. There are 1,790 miles of Class 4 stream in Utah.

Class 5 streams are now practically valueless to the fishery resource. Other water uses should take preference over fisheries use in planning water developments; however, many waters in this class could provide valuable fisheries if additional water could be provided. There are 726 miles of Class 5 stream in Utah.

Class 6 streams are those stream channels which are dewatered for significant time periods during the year. Many of the stream sections now in this class could support good to excellent fish populations if appropriate minimum flows could be provided. Planning of water developments should include consideration for restoration of these dewatered sections of stream.

General definitions of ratings associated with above classes.

X - Contains species of special interest.
R - Reproduction area (spawning habitat abundant).
N - Nursery area (rearing habitat for young fish).
B - Broad area, i.e., both reproduction and nursery.

ATTACHMENT C-3

State of Utah
Water Quality Protection Standards

Class 1 -- protected for use as a raw water source for domestic water systems.

a. Class 1A -- protected for domestic purposes without treatment.
b. Class 1B -- protected for domestic purposes with prior disinfection.
c. Class 1C -- protected for domestic purposes with prior treatment by standard complete treatment processes as required by the Utah State Division of Health.

Class 2 -- protected for in-stream recreational use and aesthetics.

a. Class 2A -- protected for recreational bathing (swimming).
b. Class 2B -- protected for boating, water skiing, and similar uses, excluding recreational bathing (swimming).

Class 3 -- protected for in-stream use by beneficial aquatic wildlife.

a. Class 3A -- protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
b. Class 3B -- protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
c. Class 3C -- protected for non-game fish and other aquatic life, including the necessary aquatic organisms in their food chain. Standards for this class will be determined on a case-by-case basis.
d. Class 3D -- protected for waterfowl, shorebirds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

Class 4 -- protected for agricultural uses, including irrigation of crops and stock watering.

Class 5 -- protected for industrial uses, including cooling, boiler makeup, and other with potential for human contact or exposure. Standards for this class will be determined on a case-by-case basis.

Class 6 -- protected for uses of waters not generally suitable for the uses identified in Classes 1 through 5 above (Utah Department of Health 1978). Standards for this class will be determined on a case-by-case basis.

Source: Utah Department of Health, 1978.

APPENDIX C (cont'd)

ATTACHMENT C-3 (cont'd)

NUMERICAL STANDARDS FOR PROTECTION OF BENEFICIAL USES OF WATER

Constituent	CLASSES: Domestic Source 1A	1B	1C	Recreation & Esthetics 2A	2B	Aquatic Wildlife 3A	3B	3C	3D	Agriculture 4	Industry 5
Bacteriological (No./100 ml)											
(Monthly Geometric Mean)											
Maximum Total Coliforms	1	50	5,000	1,000	5,000	*	*		*	*	
Maximum Fecal Coliforms	*	*	2,000	200	2,000	*	*		*	*	
Physical											
Total Dissolved Gasses	*	*	*	*	*	(d)	(d)		*	*	
Minimum DO (mg/l)	*	*	5.5	5.5	5.5	6.0	5.5		5.5	*	
Maximum Temperature	*	*	*	*	*	20°C	27°C		*	*	
Maximum Temperature Change	*	*	*	*	*	2°C	4°C		*	*	
pH	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0		6.5-9.0	*	
Chemical (Maximum mg/l)											
Arsenic	.05	.05	.05	*	*	*	*		*	.1	
Barium	1	1	1	*	*	*	*		*	*	
Cadmium	.010	.010	.010	*	*	.0004(a)	.001(a)		*	.01	
Chromium	.05	.05	.05	*	*	.10	.10		.10	.10	
Copper	*	*	*	*	*	.01	.01		*	+2	
Cyanide	*	*	*	*	*	.005	.005		*	*	
Iron	*	*	*	*	*	1.0	1.0		1.0	*	
Lead	.05	.05	.05	*	*	.05	.05		*	.1	
Mercury	.002	.002	.002	*	*	.00005	.00005		.00005	*	
Phenol	*	*	*	*	*	.01	.01		*	*	
Selenium	.01	.01	.01	*	*	.05	.05		*	.05	
Silver	.05	.05	.05	*	*	.01	.01		*	*	
Zinc	*	*	*	*	*	.05	.05		*	*	
NH3 as N (un-ionized)	*	*	*	*	*	.02	.02		*	*	
Chlorine	*	*	*	*	*	.002	.01		*	*	
Floride (a)	1.4-2.4	1.4-2.4	1.4-2.4	*	*	*	*		*	*	
NO3 as N	10	10	10	*	*	*	*		*	*	
Boron	*	*	*	*	*	*	*		*	.75	
H2S	*	*	*	*	*	.002	.002		*	*	
TDS	*	*	*	*	*	*	*		*	2500	
Radiological (Maximum pCi/l)											
Gross Alpha	15	15	15	*	*	15(c)	15(c)		15(c)	15(c)	
Radium 226, 228 comb.	5	5	5	*	*	*	*		*	*	
Strontium 90	8	8	8	*	*	*	*		*	*	
Tritium	20,000	20,000	20,000	*	*	*	*		*	*	
Pesticides(Maximum ug/l)											
Endrin	.2	.2	.2	*	*	.004	.004		.004	*	
Lindane	4	4	4	*	*	.01	.01		.01	*	
Methoxychlor	100	100	100	*	*	.03	.03		.03	*	
Toxaphene	5	5	5	*	*	.005	.005		.005	*	
2, 4-D	100	100	100	*	*	*	*		*	*	
2, 4, 5-TP	10	10	10	*	*	*	*		*	*	
Pollution Indicators (c)											
Gross Beta(pCi/l)	50	50	50	*	*	50	50		50	50	
BOD(mg/l)	*	*	5	5	5	5	5		5	5	
NO3 as N(mg/l)	*	*	*	4	4	4	4		*	*	
PO4 as P(mg/l)	*	*	*	.025	.025	.025	.025		*	*	

STANDARDS WILL BE DETERMINED ON A CASE-BY-CASE BASIS

STANDARDS WILL BE DETERMINED ON A CASE-BY-CASE BASIS

* Insufficient evidence to warrant the establishment of numerical standard. Limits assigned on case-by-case basis.

(a) Limit shall be increased threefold if $CaCO_3$ hardness in water exceeds 150 mg/l.

(b) Maximum concentration varies according to the daily maximum mean air temperature.

Temp. °C	mg/l
12.0 and below	2.4
12.1 to 14.6	2.2
14.7 to 17.6	2.0
17.7 to 21.4	1.8
21.5 to 26.2	1.6
26.3 to 32.5	1.4

(c) Investigations should be conducted to develop more information where these pollution indicator levels are exceeded.

(d) Not to exceed 110% of saturation.

APPENDIX D

ANIMAL SPECIES THAT COULD OCCUR ALONG THE PROPOSED PIPELINE CORRIDOR AND WILDLIFE RESOURCE CORRESPONDENCE

Table D-1

Fished Potentially Occurring in Waters Crossed and Within the Proposed Pipeline Corridor

ORDER / FAMILY / SCIENTIFIC NAME	COMMON NAME	REMARKS [1]
SALMONIFORMES		
Salmonidae	Trout, salmon	
Salmo clarki pleuriticus	Colorado River cutthroat	(2)
Salmo clarki utah	Utah cutthroat	(2, 3)
Salmo clarki lewisi	Yellowstone cutthroat	(1)
Salmo gairdneri	Rainbow trout	(1)
Salmo trutta	Brown trout	(1)
Salvelinus fontinalis	Brook trout	(1)
Salvelinus namaycush	Lake trout	(1)
Coregonidae	Whitefish	
Prosopium williamsoni	Mountain whitefish	(1)
CYPRINIFORMES		
Cyprinidae	Minnow and carp	
Cyprinus carpio	Carp	(6)
Gila atraria	Utah chub	(6, 5)
Gila cypha	Humpback chub	(4)
Gila elegans	Bonytail	(4)
Gila robusta	Roundtail chub	(5)
Notropis lutrensis	Red shiner	(5)
Pimephales promelas	Fathead minnow	(5)
Ptychocheilus lucius	Colorado squawfish	(4)
Rhinichthys osculus	Speckled dace	(5)
Richardsonius balteatus	Redside shiner	(5)
Catostomidae	Sucker	
Catostomus ardens	Utah sucker	(3)
Catostomus catostomus	Longnose sucker	(2, 5)
Catostomus commersoni	White sucker	(5)
Catostomus discobolus	Bluehead sucker	(2, 5)
Catostomus latipinnis	Flannelmouth sucker	(2, 5)
Catostomus platyrhynchus	Mountain sucker	(5)
Xyrauchen texanus	Humpback sucker	(3)

Table D-1 (cont'd)

ORDER FAMILY SCIENTIFIC NAME	COMMON NAME	REMARKS [1]
Ictaluridae	Catfish	
Ictalurus melas	Black bullhead	(1)
Ictalurus punctatus	Channel catfish	(1)
Cyprinodontidae	Killifish	
Fundulus zebrinus	Rio Grande Killifish	(2, 5)
PERCIFORMES		
Centrarchidae	Sunfish	
Lepomis cyanellus	Green sunfish	(5)
Lepomis macrochirus	Bluegill	(1, 5)
Micropterus dolomieui	Smallmouth bass	(1)
Micropterus salmoides	Largemouth bass	(1)
Percidae	Perch	
Perca flavescens	Yellow perch	(1, 6)
Stizostedion vitreum vitreum	Walleye	(1)
Cottidae	Sculpin	
Cottus bairdi	Mottled sculpin	(5)
Cottus bairdi semiscaber	Bonneville Baird sculpin	(5)
Cottus beldingi	Piute sculpin	(5)

1 Importance or value category

(1) Important sport species
(2) Uncommon species
(3) Rare or threatened species (or proposed)
(4) Endangered species
(5) Forage or bait species
(6) Nuisance species

Source: USDA, Forest Service, Uinta National Forest, Al Mills - Fisheries Biologist, 1982.

Table D-2

Mammals Potentially Occurring by Habitat/Vegetation Type
Along the Proposed Pipeline Corridor [1]

FAMILY / SCIENTIFIC NAME [3]	COMMON NAME	VEGETATION TYPE [2] CF	PJ	MB	SB	SG	WL
Didelphiidae	New World Opossums						
Didelphis marsupialis	Opossum	-	x	-	-	x	-
Soricidae	Shrews						
Sorex cinereus	Masked shrew	x	-	-	x	-	-
Sorex merriami	Merriam's shrew	-	x	-	x	-	-
Sorex vagrans	Wandering shrew	x	x	-	-	-	-
Sorex nanus	Dwarf shrew	x	-	-	-	-	-
Sorex palustris	Water shrew	x	-	-	-	-	x
Vespertilionidae	Vespertilinois bats						
Myotis yumanensis	Yuma myotis	-	x	-	x	x	-
Myotis thysandoes	Fringe-tailed myotis	-	x	-	-	-	-
Myotis californicus	California myotis	-	x	-	x	-	-
Myotis leibii	Small-footed myotis	-	x	-	-	-	-
Pipistrellus hesperus	Western pipistrel	-	x	-	x	-	-
Eptesicus fuscus	Big brown bat	-	x	-	-	-	-
Lasiurus borealis	Red bat	-	x	-	-	-	-
Euderma maculata	Spotted bat	-	x	-	-	-	-
Plecotus townsendii	Townsend's Big-eared bat	-	x	-	-	x	-
Antrozous pallidus	Pallid bat	-	x	-	x	x	-
Molossidae	Free-tailed bats						
Tadarida braziliensis	Brizilian free-tailed bat	-	x	-	x	x	-
Ochotonidae	Pikas						
Ochotona princeps	Pika	-	x	-	-	-	-
Leporidae	Hares and rabbits						
Sylvilagus nuttallii	Mountain Cottontail	-	x	-	x	-	-
Lepus americanus	Snowshoe hare	x	-	-	-	-	-
Lepus townsendi	White-tailed jackrabbit	-	x	-	x	-	-
Lepus californicus	Black-tailed jackrabbit	-	-	-	x	-	-

Table D-2 (cont'd)

SPECIES		VEGETATION TYPE [2]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Sciuridae	Squirrels						
Marmota flaviventris	Yellow-bellied marmot	x	x	-	-	-	-
Eutamias minimus	Least chipmunk	-	x	-	x	x	-
Eutamias dorsalis	Cliff chipmunk	-	x	x	-	-	-
Eutamias quadrivittatus	Say chipmunk	-	x	-	-	-	-
Eutamias umbrinus	Uinta chipmunk	-	x	-	x	-	-
Ammospermophilus leucurus	White-tailed Antelope Ground squirrel	-	-	-	-	-	-
Citellus richardsoni	Richardson's ground squirrel	-	-	-	x	-	-
Citellus variegatus	Rock squirrel	-	-	-	x	x	-
Citellus tereticaudus	Round-tailed ground squirrel	-	-	-	x	x	-
Citellus lateralis	Golden-mantled ground squirrel	x	x	-	-	-	-
Cynomys gunnisoni	White-tailed prairie dog	x	x	x	x	-	-
Tamiasciurus hudsonicus	Red squirrel	x	-	x	-	-	-
Glaucomys sabrinus	Northern flying squirrel	x	-	-	-	-	-
Cynomys parvidens	Utah prairie dog	-	x	-	x	x	-
Spermophilus tridecimilineatus	13-lined ground squirrel	-	x	-	x	x	-
Geomyidae	Pocket gophers						
Thomomys talpoides	Northern pocket gopher	x	x	x	x	-	-
Thomomys botteae	Valley pocket gopher	-	-	x	x	-	-
Heteromyidae	Heteromyids						
Perognathus parvus	Great Basin pocket mouse	-	x	-	x	x	-
Perognathus formosus	Long-tailed pocket mouse	-	x	-	x	x	-
Microdipodops megacephalus	Dark kangaroo mouse	-	-	-	x	x	-
Dipodomys ordi	Ord's kangaroo rat	-	-	-	x	x	-
Castoridae	Beaver						
Castor canadensis	Beaver	-WIDE RANGE [4]					
Cricetidae	New World Rats and Mice						
Reithrodontomys megalotis	Western harvest mouse	-	x	-	x	-	-
Peromyscus crinitus	Canyon mouse	-	x	-	x	x	-
Peromyscus maniculatus	Deer mouse	x	x	x	x	x	-

Table D-2 (cont'd)

FAMILY / SCIENTIFIC NAME [3]	COMMON NAME	VEGETATION TYPE [2] CF	PJ	MB	SB	SG	WL
Peromyscus boyli	Brush mouse	-	x	x	-	-	-
Peromyscus truei	Pinyon mouse	-	x	-	x	x	-
Onychomys leucogaster	Northern grasshopper mouse	-	x	-	x	-	-
Neotoma lepida	Desert woodrat	-	x	-	x	x	-
Neotoma cinerea	Bushy-tailed woodrat	x	x	x	x	-	-
Clethrionomys gapperi	Southern red-backed vole	x	-	x	-	-	-
Phenacomys intermedius	Heather vole	x	x	-	-	-	-
Microtus pennsylvanicus	Meadow vole	x	-	x	-	-	-
Microtus montanus	Montane vole	x	-	x	x	-	-
Microtus longicaudus	Long-tailed vole	x	-	-	x	-	-
Lagurus curtatus	Sagebrush vole	-	-	-	x	x [4]	-
Ondatra zibethicu	Muskrat	-WIDE RANGE [4]					
Zapodidae	Jumping Mice						
Zapus princeps	Western jumping mouse	x	-	x	-	-	-
Erethizontidae	New World porcupines						
Erethizon dorsatum	Porcupine	x	-	-	x	-	-
Canidae	Canids						
Canis latrans	Coyote	x	x	x	x	x	-
Vulpes fulva	Red fox	x	-	-	-	-	-
Urocyon cinereoargenteus	Gray fox	-	x	-	x	x	-
Ursidae	Bears						
Ursus americanus	Black bear	x	-	-	-	-	x
Procyonidae							
Procyon lotor	Raccoon	- WIDE RANGE [4]					
Bassariscus astutus	Ringtail	-	x	-	-	-	-
Mustelidae	Mustelids						
Martes americana	Marten	x	-	-	-	-	-
Mustela erminea	Ermine	x	-	-	-	-	-
Mustela frenata	Long-tailed weasel	- WIDE RANGE [4]					
Mustela nigripes	Black-footed ferret	-	-	-	x	[4]	-
Mustela vision	Mink	- WIDE RANGE [4]					
Taxidea taxus	Badger	- WIDE RANGE [4]					
Spilogale putoruis	Western spotted skunk	- WIDE RANGE [4]					
Mephitis mephitis	Striped skunk	- WIDE RANGE [4]					
Lutra canadensis	River otter	- WIDE RANGE [4]					

Table D-2 (cont'd)

SPECIES		VEGETATION TYPE [2]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Felidae	Cats						
Lynx canadensis Lynx rufus	Lynx Bobcat	x	-	- WIDE	- RANGE	- [4]	-
Cervidae	Deer						
Cervus elaphus Odocoileus heminonus Alces alces	Elk Mule deer Moose	x x	- x	- WIDE -	- RANGE -	- [4] -	- x
Antilocapridae	Pronghorn						
Antilocapra americana	Pronghorn antelope	-	-	-	x	-	-

1 Mammal occurrence and distribution along the proposed pipeline corridor according to Cranney (1982) and Griep (1982).

2 General distribution patterns indicated by vegetation type according to potential natural vegetation.

Type designations are:
CF - coniferous forest
PJ - pinyon/juniper
MB - mountain brush
SB - sagebrush
SG - saltbrush/greasewood
WL - wetlands

A wetlands (WL) category, although not necessarily considered one particular vegetation type, is included to represent uniquely dependent species (e.g., muskrat and beaver).

3 Scientific names taken from: Burt, W.H. and R.P. Grossenheider. 1979. A field guide to the mammals. Third Edition. The Peterson Field Guide Series. Houghton Mifflin Company Boston.

4 "Wide Range" indicates that the species occasionally may be found in any of the listed types under certain species-specific conditions.

Source: USDA, Forest Service, Uinta National Forest, Al Mills - Fisheries Biologist, 1982.

Table D-3

Potentially Occurring Reptiles and Amphibians and Their Habitat by Vegetation Types Along the Proposed Pipeline Route

FAMILY	SPECIES		VEGETATION TYPE [1]					
	SCIENTIFIC NAME [2]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Amphibia		Salamanders						
	Ambystoma tigrinum	Tiger salamander	x	x	x	x	-	x
Amphibia		Frogs and toads						
	Rana catesbeiana	Bullfrog			- WIDE RANGE [3]			
	Rana aurora	Red-legged frog	-	-	x	x	-	x
	Rana clamitans	Green frog	-	-	x	-	-	x
	Rana pretiosa	Spotted frog	x	-	x	-	-	x
	Rana pipiens	Leopard frog			- WIDE RANGE [3]			
	Pseudacris triseriata	Chorus frog	x	x	-	-	-	x
	Scaphiopus hammondi	Great Basin Spadefoot toad	-	x	-	x	x	x
	Bufo boreas	Boreal toad	x	x	-	x	-	x
	Bufo cognatus	Great Plains toad	-	-	-	-	-	x
	Bufo microscaphus	Southwestern toad	-	-	-	-	-	x
	Bufo woodhousei	Rocky Mountain toad	-	x	-	x	-	x
Reptilia		Lizards						
	Crotaphytus collaris	Collared lizard	-	-	-	x	x	-
	Crotaphytus wislizenii	Leopard lizard	-	-	-	x	x	-
	Sceloporus undulatus	Eastern fence lizard	-	x	-	-	x	-
	Sceloporus graciosus	Sagebrush lizard	-	x	-	x	x	-
	Uta stansburiana	Side-blotched lizard	-	-	-	x	x	-
	Phrynosoma platyrhinos	Desert-horned lizard	-	-	-	x	x	-
	Phrynosoma douglassi	Short-horned lizard	-	x	-	x	-	-
	Eumeces skiltonianus	Western skink	-	x	x	x	-	-
	Cnemidophorus tigris	Western whiptail	-	x	-	x	x	-
Reptilia		Snakes						
	Charina bottae	Rubber Boa	x	x	-	-	-	-
	Diadophis punctatus	Ringneck snake	-	-	x	-	-	-
	Opheodrys vernalis	Smooth green snake	x	-	-	-	-	-
	Coluber constrictor	Yellow-bellied Racer	-	x	-	x	-	-
	Masticophis taeniatus	Desert striped whipsnake	-	x	x	x	-	-
	Lampropeltis pyromelana	Mountain kingsnake	x	x	x	-	-	-
	Lampropeltis triangulum	Milk snake	x	x	-	-	-	-

Table D-3 (cont'd)

FAMILY / SCIENTIFIC NAME [2]	COMMON NAME	VEGETATION TYPE [1] CF	PJ	MB	SB	SG	WL
Thamnophis sirtalis	Common garter snake	x	-	-	-	-	x
Thamnophis elegans	Wandering garter snake			- WIDE RANGE [3]			
Hypsiglena torquata	Night snake	-	x	-	x	x	-
Crotalus viridis	Western rattlesnake	x	x	x	x	-	-

1 Vegetation types follow Kuchler's potential natural vegetation classification (1964). Modified type designations are:

CF - coniferous forest
PJ - pinyon/juniper
MB - mountain brush
SB - sagebrush
SG - saltbrush-greasewood
WL wetlands

A wetlands (WL) category, although not necessarily considered one particular vegetation type, is included to represent breeding areas and uniquely dependent species (e.g., amphibians).

2 Scientific names of reptiles and amphibians follow those in: Stebbins, R.C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston.

3 "Wide Range" indicates that the species occasionally may be found in any of the listed types under certain species-specific conditions.

Source: USDA Forest Service, Uinta National Forest, Al Mills - Fisheries Biologist, 1982.

Table D-4

Bird Species That Potentially Occur Along the Proposed Pipeline Corridor [1]

FAMILY / SCIENTIFIC NAME [3]	COMMON NAME	VEGETATION TYPE [2] CF	PJ	MB	SB	SG	WL
Cathartidae	American vultures						
Cathartes aura	Turkey vulture	-	x	x	x	x	-
Accipitridae	Hawks, Old World vultures, and harriers						
Accipiter gentilis	Goshawk	x	-	-	-	-	-
Accipiter striatus	Sharp-shinned hawk	x	-	-	x	-	-
Accipiter cooperii	Cooper's hawk	x	-	x	-	-	-
Buteo jamicensis	Red-tailed hawk			- WIDE RANGE [4]			
Buteo lagopus	Rough-legged hawk			- WIDE RANGE [4]			
Buteo swainsoni	Swainson's hawk	-	x	-	x	x	-
Buteo regalis	Ferruginous hawk	-	x	x	x	x	-
Aquila chrysaetos	Golden eagle			- WIDE RANGE [4]			
Haliaeetus leucocephalus [5]	Bald eagle						
Circus cyaneus	Marsh hawk	-	x	x	x	x	x
Pandionidae	Ospreys						
Pandion haliaetus	Osprey	x	-	-	-	-	x
Falconidae	Falcons						
Falco mexicanus	Prarie falcon			- WIDE RANGE [4]			
Falco peregrinus [6]	Peregrine falcon						
Falco columbaris	Merlin	x	-	x	-	-	-
Falco sparverius	Sparrow hawk			- WIDE RANGE [4]			
Tetraonidae	Grouse						
Dendragapus obscurus	Blue grouse	x	-	x	-	-	-
Bonasa umbellus	Ruffed grouse	x	-	x	-	-	-
Centrocercus urophasianus	Sage grouse	-	x	x	x	-	-
Phasianidae	Quails and pheasants						
Lophortyx californicus	California quail	-	-	x	x	-	-
Phasianus colchicus	Ring-necked pheasant	-	-	x	x	x	-
Alectoris chuka	Chukar	-	x	x	-	-	-
Perdix perdix perdix	Gray partridge	-	-	x	x	-	-

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE [2]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Gruidae	Cranes						
Grus americanus	Whooping crane	-	-	-	-	-	x
Grus canadensis	Sandhill crane	-	-	-	-	-	x
Rallus limicola	Virginia rail	-	-	-	-	-	x
Porzana carolina	Sora	-	-	-	-	-	x
Gallinula chloropus	Common gallinule	-	-	-	-	-	x
Fulica americana	American coot	-	-	-	-	-	x
Charadriidae	Plovers						
Charadrius semipalmatus	Semipalmated plover	-	-	-	-	-	x
Charadrius alexandrinus	Snowy plover	-	-	-	-	-	x
Charadrius vociferus	Killdeer	-	-	x	x	-	x
Eupoda montanus	Mountain plover	-	-	-	-	-	x
Pluvialis dominica	American golden plover	-	-	-	-	-	x
Squatarda squatarola	Black-bellied plover	-	-	-	-	-	x
Scolopacidae	Sandpipers						
Capella gallinago	Common snipe	-	-	-	-	-	x
Numenius americanus	Long-billed curlew	-	-	-	-	-	x
Numenius phaopus	Whimbrel	-	-	-	-	-	x
Bartramia longicauda	Upland sandpiper	-	-	-	-	-	x
Actitus macularia	Spotted sandpiper	-	-	-	-	-	x
Tringa solitaria	Solitary sandpiper	-	-	-	-	-	x
Catoptrophorus semipalmatus	Willet	-	-	-	-	-	x
Totanus melanoleucus	Greater yellowlegs	-	-	-	-	-	x
Totanus flavipes	Lesser yellowlegs	-	-	-	-	-	x
Calidris canutus	Red knot	-	-	-	-	-	x
Erolia melanotos	Pectoral sandpiper	-	-	-	-	-	x
Erolia bairdii	Baird's sandpiper	-	-	-	-	-	x
_____ minutella	Least sandpiper	-	-	-	-	-	x
_____ alpina	Dunlin	-	-	-	-	-	x
Calidris pusillus	Semipalmated sandpiper	-	-	-	-	-	x
Calidris mauri	Western sandpiper	-	-	-	-	-	x
Calidris alba	Sanderling	-	-	-	-	-	x
Limnodromus griseus	Short-billed dowitcher	-	-	-	-	-	x
Limnodromus scolopaceus	Long-billed dowitcher	-	-	-	-	-	x
Limosa fedoa	Marbled godwit	-	-	-	-	-	x
Recurvirostridae	Avocets and stilts						
Recurvirostra americana	American avocet	-	-	-	-	-	x
Himantopus mexicanus	Black-necked stilt	-	-	-	-	-	x

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE [2]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Phalaropodidae - Phalaropes							
Phalaropus fulicarus	Red Phalarope	-	-	-	-	-	x
Steganopus tricolor	Wilson's Phalarope	-	-	-	-	-	x
Lobipes lobatus	Northern Phalarope	-	-	-	-	-	x
Stereorariidae - Jaegers							
Stercorarius parasiticus		-	-	-	-	-	x
Laridae - Gulls and Terns							
Larus hyperboreus	Glaucous Gull	-	-	-	-	-	x
Larus argentatus	Herring Gull	-	-	-	-	-	x
Larus californicus	California Gull	-	-	-	-	-	x
Larus delawarensis	Ring-billed Gull	-	-	-	-	-	x
Larus pipixcan	Franklin's Gull	-	-	-	-	-	x
Larus philidelphia	Bonaparte's Gull	-	-	-	-	-	x
Xema sabini	Sabine's Gull	-	-	-	-	-	x
Sterna fosteri	Foster's Tern	-	-	-	-	-	x
Sterna hirundo	Common Tern	-	-	-	-	-	x
Hydroprogne caspia	Caspian Tern	-	-	-	-	-	x
Chlidonias niger	Black Tern	-	-	-	-	-	x
Columbiformes - Pigeons and Doves							
Columbia fasciata	Band-tailed Pigeon	-	-	x	-	[4]	-
Zenaida macroura	Mourning Dove			WIDE RANGE		[4]	
Columbia livia*	Rock Dove			WIDE RANGE			
Cuclidae - Cuckoos							
Coccyzus americanus	Yellow-billed Cuckoo	-	-	-	x	-	x
Tytonidae - Barn Owls							
Tyto alba	Barn Owl	-	x	x	x	x	-

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE [2]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Strigidae - Typical Owls							
Otus asio	Screech Owl	-	-	-	x	-	-
Otus flammeolus	Flammulated Owl	x	-	-	-	-	-
Bubo virginianus	Great Horned Owl			WIDE	RANGE	[4/]	
Glaucidium gnoma	Pygmy Owl	x	x	x	x	-	-
Speotyto cunicularia	Burrowing Owl	-	-	-	x	-	-
Strix occidentalis	Spotted Owl	x	-	x	x	-	x
Asio otus	Long-eared Owl	-	-	-	x	-	x
Asio flammeus	Short-eared Owl	-	-	-	x	-	x
Aegolius acadieus	Saw-shet Owl	x	x	x	-	-	-
Caprimulgidae - Goatsuckers							
Phalaenoptilus nutalli	Poor-will	x	x	x	x	x	-
Chordeiles minor	Common Nighthawk	x	x	x	x	x	-
Apodidae - Swifts							
Cypseloides niger	Black Swift	x	-	-	x	x	-
Aeronautes saxatalis	White-throated Swift	-	x	x	x	x	-
Trochilidae - Hummingbirds							
Archilochus alexandri	Black-chinned Hummingbird	-	x	x	x	x	-
Selasphorus platycercus	Broad-tailed Hummingbird	x	x	x	x	-	-
Stellula calliope	Calliope Hummingbird	x	-	x	-	-	-
Alcedinidae - Kingfishers							
Megaceryle alcyon	Belted Kingfisher	-	-	x	x	-	x

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE [2]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Picidae - Woodpeckers							
Colaptes auratus	Common Flicker	x	x	-	x	-	-
Dryocopos pileatus	Pileated Woodpecker	x	-	-	-	-	-
Asyndesmus lewis	Lewis's Woodpecker	-	-	x	x	-	-
Sphyrapicus varius	Yellow-bellied Sapsucker	x	-	x	-	-	-
Sphyrapicus thyroideus	Williamson's Sapsucker	x	-	-	-	-	-
Dendrocopos villosus	Hairy Woodpecker	x	x	-	x	-	-
Dendrocopos pubescens	Downy Woodpecker	x	x	-	x	-	-
Picoides tridactylus	Northern Three-toed Woodpecker	x	-	-	-	-	-
Tyrannidae - Tyrant Flycatchers							
Tyrannus tyrannus	Eastern Kingbird	-	-	-	x	-	-
Tyrannus verticalis	Western Kingbird	-	x	-	x	-	-
Tyrannus vociferans	Cassin's Kingbird	-	x	-	-	-	-
Myiarchus tyrannulus	Wied's Crested Flycatcher	-	-	-	-	-	-
Myiarchus cinarescens	Ash-throated Flycatcher	-	x	-	-	x	-
Sayornis nigricans	Black Phoebe	-	-	-	-	x	-
Sayornis saya	Say's Phoebe	-	x	-	x	x	-
Empidonax traillii	Traill's Flycatcher	-	x	-	x	-	-
Empidonax hammondii	Hammond's Flycatcher	x	-	-	-	-	-
Empidonax oberholseri	Dusky Flycatcher	x	-	x	-	-	-
Empidonax wrightii	Gray Flycatcher	-	x	-	x	-	-
Empidonax difficilis	Western Flycatcher	x	x	x	-	-	-
Contopus sordidulus	Western Wood Peewee	x	-	-	-	-	-
Nuttallornis borealis	Olive-sided Flycatcher	x	-	-	-	-	-
Alaudidae - Larks							
Eremophila alpestrus	Horned Lark	-	-	-	x	x	-
Hirundinidae - Swallows							
Tachycineta thallasina	Violet-Green Swallow	x	x	x	x	x	x
Iridoprocne bicolor	Tree-Swallow	x	-	-	-	-	-
Riparia riparia	Bank Swallow	-	-	-	x	-	x
Stelgidopteryx ruficollis	Rough-winged Swallow	-	-	-	x	-	-
Hirundo rustica	Barn Swallow	-	-	x	x	-	x
Petrochelidon pyrrhonota	Cliff Swallow	-	-	x	x	-	x
Progne subis	Purple Martin	x	-	-	-	-	-

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE [2/]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Corridae - Jays and Crows							
Perisorius canadensis	Gray Jay	x	-	-	-	-	-
Cyanocitta stalleri	Steller's Jay	x	-	-	-	-	-
Aphelocoma coerulescens	Scrub Jay	-	x	x	-	-	-
Pica pica	Black-billed Magpie	-	x	x	x	-	-
Corvus corax	Common Raven	x	x	x	x	-	-
Corvus brachyrhynchos	Common Crow	-	x	-	x	x	-
Gymnorhinus cyanocephalus	Pinon Jay	-	x	-	-	-	-
Nucifraga columbiana	Clark's Nutcracker	x	-	-	-	-	-
Paridae - Titmice and Bushtits							
Parus atricapillus	Black-capped Chickadee	x	-	x	x	-	-
Parus gambeli	Mountain Chickadee	x	x	x	-	-	-
Parus inornatus	Plain Titmouse	-	x	-	-	-	-
Psaltriparus minimus	Bushtit	x	x	x	x	-	-
Sittidae - Nuthatches							
Sitta pygamaea	Pygmy Nuthatch	x	x	x	-	-	-
Sitta carolinensis	White-breasted Nuthatch	x	x	x	-	-	-
Sitta canadensis	Red-breasted Nuthatch	x	-	-	-	-	-
Certhiidae - Creepers							
Certhia familiaris	Brown Creeper	x	-	-	-	-	-
Cinclidae - Dippers							
Cinclus mesicanus	Dipper	x	-	-	-	-	x
Troglodytidae - Wrens							
Troglodytes aedon	House Wren	x	-	x	-	-	-
Thryomanes bewickii	Bewick's Wren	-	x	x	x	x	-
Campylorhynchus brunneicapillus	Cactus Wren	-	-	-	-	-	-
Telmatodytes palustris	Long-billed Marsh Wren	-	-	-	-	-	x

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE 2/					
FAMILY SCIENTIFIC NAME 3	COMMON NAME	CF	PJ	MB	SB	SG	WL
Mimidae - Mockingbirds and Thrashers							
Mimus polyglottis	Mockingbird	-	-	-	-	x	-
Dumetella carolinensis	Gray Catbird	-	-	x	-	-	-
Toxostoma rufum	Brown Thrasher	-	-	-	-	x	-
Toxostoma bendirei	Bendire's Thrasher	-	-	-	-	x	-
Oreoscoptes montanus	Sage Thrasher	-	-	-	x	x	-
Motacillidae - Pipits							
Anthus spinoletta	Water Pipit	-	-	-	-	-	x
Turdidae - Thrushes							
Turdus migratorius	American Robin	x	x	x	x	x	-
Catharus guttatus	Hermit Thrush	x	-	-	-	-	-
Catharus ustulatus	Swainson's Thrush	x	-	-	-	-	-
Catharus fuscescens	Veery	x	-	-	-	-	-
Sialia mexicana	Western Bluebird	-	x	x	-	-	-
Sialia currucoides	Mountain Bluebird	x	x	x	x	x	-
Myadestes townsendi	Townsend's Solitaire	x	x	x	-	-	-
Silviidae - Old World Warblers							
Polioptila caerulaa	Blue-gray Gnatcatcher	-	x	x	x	-	-
Regulus satrapa	Golden-crowned Kinglet	x	-	-	-	-	-
Regulus calendula	Ruby-crowned Kinglet	x	-	-	-	-	-
Bombycillidae - Waxwings							
Bombycilla garrulus	Bohemian Waxwing	-	x	-	-	-	-
Bombycilla cedrorum	Cedar Waxwing	-	x	-	-	-	-
Ptilogonatidae - Silky Flycatchers							
Laniidae - Shrikes							
Lanius excubitor	Northern Shrike	-	x	-	x	x	-
Lanius ludovicianus	Loggerhead Shrike	-	x	-	x	x	-

Table D-4 (cont'd)

FAMILY / SCIENTIFIC NAME [3]	COMMON NAME	VEGETATION TYPE [2] CF	PJ	MB	SB	SG	WL
Virenonidae - Vireos							
Vireo vicinior	Gray Vireo	-	x	-	-	-	-
Vireo solitarius	Solitary Vireo	x	x	x	-	-	-
Vireo gilvus	Warbling Vireo	x	-	x	x	-	-
Parulidae - Wood Warblers							
Verminvora celata	Orange-crowned Warbler	x	-	x	-	-	-
Verminvora virginiae	Virginia's Warbler	x	-	x	-	-	-
Dendroica petechia	Yellow Warbler	x	-	x	x	-	-
Dendroica coronata	Myrtle Warbler	x	-	x	-	-	-
Dendroica nigrescens	Black-throated Gray Warbler	-	x	-	-	-	-
Oporonis agilis	MacGillivray's Warbler	x	-	x	-	-	-
Geothlypis trichas	Common Yellowthroat	-	-	x	-	-	-
Icteria virens	Yellow-breasted Chat	x	-	x	x	-	-
Wilsonia pusilla	Wilson's Warbler	x	-	-	-	-	-
Setophaga ruticilla	American Redstart	x	-	-	x	x	-
Icteridae - Blackbirds							
Dolichonyx oryzivorus	Bobolink	-	-	x	-	-	-
Sturnella neglecta	Western Meadowlark	-	-	x	x	x	-
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	-	-	-	-	-	x
Agelaius phoeniceus	Red-winged Blackbird	-	-	-	-	-	x
Icterus parisorum	Scott's Oriole	-	x	-	-	-	-
Icterus galbula	Northern Oriole	-	-	x	x	-	-
Euphagus cyanocephalus	Brewer's Blackbird	-	-	-	x	-	-
Molothrus ater	Brown-headed Cowbird	-	-	-	x	x	x
Thraupidae - Tanagers							
Piranga ludoviciana	Western Tanager	x	-	x	-	-	-
Fringillidae - Finches and Sparrows							
Pheucticus melanocephalus	Black-headed Grosbeak	-	-	-	x	-	-
Guiraca caerulea	Blue Grosbeak	-	-	-	x	-	-

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE [2/]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME	CF	PJ	MB	SB	SG	WL
Passerina cyanea	Indigo Bunting	-	-	-	-	-	-
Passerina amoena	Lazuli Bunting	x	-	x	-	-	-
Hesperiphona vespertina	Evening Grosbeak	x	-	x	-	-	-
Capodacus cassinii	Cassin's Finch	x	-	-	-	-	-
Capodacus mexicanus	House Finch	-	x	x	x	x	-
Pinicola enucleator	Pine Grosbeak	x	-	x	-	-	-
Spinus pinus	Pine Siskin	x	x	x	x	x	-
Spinus tristis	American Goldfinch	x	-	x	-	-	-
Spinus psaltria	Lesser Goldfinch	x	-	x	x	-	-
Loxia curvirostra	Red Crossbill	x	-	-	-	-	-
Chlorura chlorura	Green-tailed Towhee	x	-	x	x	-	-
Pipilo erythrophthalmus	Rofous-sided Towhee	x	x	x	-	-	-
Passerculus sandwichensis	Savannah Sparrow	-	-	x	-	-	-
Pooecetes gramineus	Vesper Sparrow	-	x	x	x	-	-
Chondestes grammacus	Lark Sparrow	-	x	x	x	-	-
Aimphispiza bilineata	Black-throated Sparrow	-	-	-	x	x	-
Aimphispiza belli	Sage Sparrow	-	-	-	x	-	-
Junco caniceps	Gray-headed Junco	x	-	-	-	-	-
Spizella passerina	Chipping Sparrow	x	x	x	x	-	-
Spizella breweri	Brewer's Sparrow	-	x	-	x	x	-
Zonotrichia leucophrys	White-crowned Sparrow	x	-	-	-	-	-
Passerella iliaca	Fox Sparrow	x	-	x	-	-	-
Melospiza lincolnii	Lincoln Sparrow	-	-	x	-	-	-
Melospiza melodia	Song Sparrow	-	-	x	x	-	-
Leucostictae atrata	Black Rosy Finch	x	-	x	-	-	-
Junco hyemalis	Dark Eyed Junco	x	-	-	-	-	-
Gaviidae - Loons							
Gavia immer	Common Loon	-	-	-	-	-	x
Podicipedidae - Grebes							
Podicepes auritus	Horned Grebe	-	-	-	-	-	x
Podicepes nigricollis	Eared Grebe	-	-	-	-	-	x
Aechomorphorus occidentalis	Western Grebe	-	-	-	-	-	x
Podilymbus podiceps	Pied Billed Grebe	-	-	-	-	-	x

Table D-4 (cont'd)

SPECIES		VEGETATION TYPE 2/					
FAMILY SCIENTIFIC NAME 3	COMMON NAME	CF	PJ	MB	SB	SG	WL
Peliconidae - Pelicans							
Pelicanus erythrorhynchus	White Pelican	-	-	-	-	-	x
Pelicanus occidentalis	Brown Pelican	-	-	-	-	-	x
Phalacrocoracidae - Cormorants							
Phalacrocras auritus	Double-crested cormorant	-	-	-	-	-	x
Ardeidae - Herons, Bitterns							
Ardea herodias	Great Blue Heron	-	-	-	-	-	x
Casmerodius albus	Great Egret	-	-	-	-	-	x
Egretta thula	Snowy Egret	-	-	-	-	-	x
Nycticorax nycticorax	Black-Crowned Night Heron	-	-	-	-	-	x
Botaurus lentiginosus	American Bittern	-	-	-	-	-	x
Threshiornithidae - Ibis							
Plegadis chiki	White-faced Ibis	-	-	-	-	-	x
Anatidae - Swans, Geese, Ducks							
Olor columbianus	Whistling Swan	-	-	-	-	-	x
Branta canadensis	Canada Goose	-	-	-	-	-	x
Anser albifrons	White-fronted Goose	-	-	-	-	-	x
Chen caerulescens	Snow Goose	-	-	-	-	-	x
Anas platyrhynchos	Mallard Duck	-	-	-	-	-	x
Anas strepera	Gadwall Duck	-	-	-	-	-	x
Anas acuta	Pintail Duck	-	-	-	-	-	x
Anas crecca	Green-wing Teal	-	-	-	-	-	x
Anas discors	Blue-wing Teal	-	-	-	-	-	x
Anas cyanoptera	Cinnamon Teal	-	-	-	-	-	x
Anas americana	American Widgeon	-	-	-	-	-	x
Anas clypeata	Shoveler	-	-	-	-	-	x

Table D-4 (cont'd)

SPECIES			VEGETATION TYPE [2]					
FAMILY SCIENTIFIC NAME [3]	COMMON NAME		CF	PJ	MB	SB	SG	WL
Aix sponsa	Wood Duck		-	-	-	-	-	x
Aythya americana	Redhead Duck		-	-	-	-	-	x
Aythya collaris	Ringed-neck Duck		-	-	-	-	-	x
Aythya valisneria	Canvasback Duck		-	-	-	-	-	x
Aythya marila	Greater Scaup		-	-	-	-	-	x
Aythya affinus	Lesser Scaup		-	-	-	-	-	x
Bucephala clangula	Common Goldeneye		-	-	-	-	-	x
Bucephala islandica	Barrows Goldeneye		-	-	-	-	-	x
Bucephala albeola	Bufflehead		-	-	-	-	-	x
Oxyura jamaicensos	Ruddy Duck		-	-	-	-	-	x
Lothodytes cuculatus	Hooded merganser		-	-	-	-	-	x
Mergus merganser	Common merganser		-	-	-	-	-	x
Mergus serrator	Red-breasted merganser		-	-	-	-	-	x

1 Occurrence and distribution according to Griep (1982).

2 General distribution patterns indicated by vegetation type according to potential natural vegetation. Type designations are:

CF - Coniferous Forest
PJ - Pinyon/Juniper
MB - Mountain Brush
SB - Sagebrush
SG - Saltbrush-Greasewood
WL - Wetlands

3 Scientific names of birds follow those in: Robbins, C.S., B. Bruun, and H.S. Zim. 1966. A guide to field identification - Birds of North American. Golden Press. New York.

4 "Wide Range" indicates that the species occasionally may be found in any of the listed types under certain species-specific conditions.

5 Bald Eagles, which are designated as endangered, are "common winter visitors" in certain areas of Utah.

6 Peregrine Falcons, which are designated as endangered, are "rare transients" in Utah.

Source: USDA Forest Service, Uinta National Forest, Al Mills - Fisheries Biologist, 1982.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO—UTAH
1311 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

SPECIAL PROJECTS STAFF

DEC 29 1981

RECEIVED

IN REPLY REFER TO:

18 December 1981

MEMORANDUM

TO: Chief
Environmental Impact Statement Office
Bureau of Land Management
Denver, Colorado

FROM: Acting Area Manager
Area 5
Fish and Wildlife Service
Salt Lake City, Utah

SUBJECT: Uinta Basin Synfuels Project - Supplemental List

We have received your memorandum of 20 November 1981 concerning the Ra.gely, Colorado to Salt Lake City, Utah pipeline feature of the Uintah Basin Synfuels Project. Our 23 October 1981 response to your 23 September 1981 request of a list of threatened and endangered species in the vicinity of the project remains adequate. Threatened and endangered species in the area traversed by the proposed pipeline include the following:

black-footed ferret	Mustela nigripes
bald eagle	Haliaeetus leucocephalus
American peregrine falcon	Falco peregrinus anatum
humpback chub	Gila cypha
bonytail chub	Gila elegans
Colorado squawfish	Ptychocheilus lucius
Uinta Basin hookless cactus	Sclerocactus glaucus

If we can be of any further assistance, please advise us.

Robert D. Jacobsen

United States Department of the Interior
FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO-UTAH
1311 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

OCT 30 1981
RECEIVED

IN REPLY REFER TO:

23 October 1981

MEMORANDUM

TO: Team Manager
Special Projects Environmental Impact Team
Bureau of Land Management
Denver, Colorado

FROM: Acting Area Manager
Area 5
Fish and Wildlife Service
Salt Lake City, Utah

SUBJECT: Uintah Basin Synfuels Projects

We have reviewed your 23 September 1981 memorandum requesting a list of Federally listed and proposed plant and animal species in the potential impact area of Enercor-Mono Power, Magic Circle, Paraho, Syntana-Utah, Tosco, Geokinetics, and Sohio Shale Oil, tar sands and oil shale development projects in northeast Utah. The following are the Federally listed threatened and endangered species in the project area with the name of the recovery team chairman as you requested.

Species	Recovery Team Leader
1. black-footed ferret (Mustela nigripes)	Dr. Raymond L. Linder South Dakota Cooperative Wildlife Research Unit Department of Wildlife and Fisheries Sciences South Dakota State University Brookings, South Dakota 57006 [605] 688-6121
2. bald eagle (Haliaeetus leucocephalus)	Dr. James Grier North Dakota State University Fargo, North Dakota 58102 [201] 237-8444
3. American peregrine falcon (Falco peregrinus anatum)	Mr. Gerald Craig Colorado Division of Wildlife P. O. Box 2287 Fort Collins, Colorado 80522 [303] 482-6575

4. humpback chub (Gila cypha)
5. bonytail chub (Gila elegans)
6. Colorado squawfish (Ptychocheilus lucius)
7. Uinta Basin hookless cactus (Sclerocactus glaucus)

Vacant
Contact: John Gill
Endangered Species Office
U.S. Fish and Wildlife Service
Room 1311, Federal Building
125 South State Street
Salt Lake City, Utah 84138
[801] 524-4430

In addition to the above official Federally listed species we would bring to your attention the following species identified in the Federal Register of 15 December 1980. These plant species are candidates for official listing by the Fish and Wildlife Service. While they are not at present protected under the Endangered Species Act, they should be considered in environmental planning so as to avoid further degradation to their limited populations and possible extinction. These species include:

Glaucocarpum suffrutescens
Cryptantha barnebyi
Aquilegia barnebyi
Arabis sp. (underscribed species from the Gray Knolls)
Astragalus hamiltonii
Astragalus lutosus
Festuca dasyclada
Penstemon goodrichii
Penstemon grahamii
Penstemon sp. (underscribed species from the White River)
Thelypodiopsis argillaceae

The District Office of the Bureau of Land Management in Vernal, Utah has in its files much of the best information available on the distribution of these plant species. The Fish and Wildlife Service requests the opportunity to photo copy this information for our own records. Mr. Larry England of our Endangered Species Office is preparing listing packages for Glaucocarpum suffrutescens, Festuca dasyclada, and the White River Penstemon, he has also prepared a draft recovery plan for Sclerocactus glaucus. Dr. James Miller of our Regional Office in Denver is preparing a listing package for Cryptantha barnebyi.

Section 7(c) also requires the Federal agency proposing a major Federal action significantly affecting the quality of the human environment to conduct and submit to the FWS a biological assessment to determine the effects of the proposal on listed and proposed species. The biological assessment shall be completed within 180 days after the date on which initiated or a time mutually agreed upon between the agency and the FWS. Before any contracts for construction are entered into, and before construction is begun the assessment must be completed. If the biological assessment is not begun within 90 days, you should verify this list with us prior to initiation of your assessment. We do not feel that we can adequately assess the effects of the proposed action on listed and proposed species or critical habitat and proposed critical habitat without a complete assessment. When conducting a biological assessment, you shall, at a minimum:

1. conduct a scientifically sound on-site inspection of the area affected by the action, which must, unless otherwise directed by the FWS, include a detailed survey of the area to determine if listed or proposed species are present or occur seasonally and whether suitable habitat exists within the area for either expanding the existing population or potential reintroduction of populations;

2. interview recognized experts on the species at issue, including those within the Fish and Wildlife Service, the National Marine Fisheries Service, state conservation agencies, universities, and others who may have data not yet found in scientific literature;

3. review literature and other scientific data to determine the species' distribution, habitat needs, and other biological requirements;

4. review any other relevant information.

The FWS representative who will provide you with technical assistance is J. Larry England of our Endangered Species Team in Salt Lake City, Utah ([801] 524-4430; FTS 588-4430).

After your agency has completed and reviewed the assessment, it is your responsibility to determine if the proposed action "may affect" any of the listed species or critical habitats. You should also determine if the action is likely to jeopardize the continued existence of proposed species or result in the destruction or an adverse modification of any critical habitat proposed for such species. If the determination is "may affect" for listed species you must request in writing formal consultation from the Area Manager, U. S. Fish and Wildlife Service at the address given above. In addition, if you determine that the proposed action is likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat, you must confer with the FWS. At this time you should provide this office a copy of the biological assessment and any other relevant information that assisted you in reaching your conclusion.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

The FWS can only enter into formal Section 7 consultation with another Federal agency or its designee. State, county or any other governmental or private organizations can participate in the consultation process, help prepare information such as the biological assessment, participate in meetings, etc. We are prepared to assist you whenever you have questions which we may be able to answer. If we can be of further assistance, please advise us.

William C. Estate

sfate of utah

DIVISION OF WILDLIFE RESOURCES
EQUAL OPPORTUNITY EMPLOYER
DOUGLAS F. DAY
Director
1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

December 23, 1981

SPECIAL PROJECTS STAFF
DEC 29 1981
RECEIVED

Mr. Charles R. Tulloss
Chief, EISO Office
Bureau of Land Management
Special Projects Staff
3rd Floor, East
555 Zang Street
Denver, Colorado 80228

Dear Mr. Tulloss:

In response to your letter and map concerning a proposed new pipeline from Rangely, Colorado, to Salt Lake City, Utah, parallel to the existing Chevron Pipeline, we submit the following.

We have no serious concerns due to the temporary nature of the disturbance and the route proposed. The corridor parallels an existing Chevron pipeline and although much healing has occurred since the Chevron project we would recommend following the same corridor with this and other future projects.

Big game movement across the proposed route occurs throughout the area at varying times throughout the year. We assume the pipeline to be a buried line. If so, big game movement will be impacted temporarily during construction only. If the line is to be above ground, provision for big game movement will be necessary.

We also feel that due to the temporary nature of the disturbance, little would be accomplished in providing a raft of data on seasonal distributions and movement patterns of game and important nongame species on the alignment. Our comments are directed to timing of construction to avoid the periods of critical wildlife activity in key areas. The proposed pipeline will not cross any Division lands as best we can determine.

Colorado state line to milepost 40 in Wonsits Valley:

A. Antelope Range - fawning area

No construction activities May 10 to June 20.

GOVERNOR
Scott M. Matheson

DEPT. OF NATURAL RESOURCES
Gordon E. Harmston
Exec. Director

WILDLIFE BOARD
Roy L. Young - Chairman
Lewis C. Smith
L. S. Skiddis
Warren T. Harward
Chris P. Joullas

Green River crossing - approximately milepost 43

A. Endangered fish species: Colorado squawfish, bonytail chub, humpback chub.

1. Crossing site would need approval. Bank riprapping mandatory.

Same area as above:

A. High use waterfowl area - Ouray Refuge.

1. No construction from March 15 to July 15.

Milepost 117 (approximate) to milepost 126 (approximate):

A. Elk and deer fawning and calving area.

No construction activities May 16 to July 1.

Milepost 168 to milepost 172:

A. Elk and deer winter range

1. No construction from December 1 to April 30.

We hope this information will be of value to you. Our Division personnel will be available for discussion of on-site problems should the need arise.

Sincerely,

Douglas F. Day
Director

APPENDIX E

CLASSIFICATION OF FARMLANDS

Farmlands of National Importance

PRIME FARMLAND. In general, prime farmlands have adequate and dependable water supply from irrigation (a dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years, for crops commonly grown); a favorable temperature and growing season; acceptable acidity or alkalinity; acceptable salt and sodium content; and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for long periods of time and they either do not flood frequently or are protected from flooding. Specific criteria used to identify prime farmland can be found in Public Law 95-87 Section 657.5; published in the Federal Register on January 31, 1978.

UNIQUE FARMLAND. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yield of a specific crop, when treated and managed according to acceptable farming methods.

Farmlands of Statewide Importance

This is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land is determined by the appropriate Utah and Colorado state agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

Source (BLM/REA 1981)

APPENDIX F

TRANSPORTATION SYSTEM CROSSINGS

Table F-1

M.P.	Name and Type of System	County
5	Above ground pipeline	Uintah
7	Above ground pipeline	Uintah
8	Unpaved road	Uintah
12	Pipeline	Uintah
19	Unpaved road	Uintah
20	Unpaved road	Uintah
21	Unpaved road	Uintah
22	State Highway 88	Uintah
25	Unpaved road	Uintah
28	Unpaved road	Uintah
33	Unpaved road	Uintah
39	Unpaved road	Duchesne
41	Unpaved road	Duchesne
43	Light duty paved road	Duchesne
44	Unpaved road	Duchesne
45	Unpaved road	Duchesne
46	Light duty paved road	Duchesne
47	Unpaved road	Duchesne
48	U.S. Highway 40	Duchesne
49	Unpaved road	Duchesne
50	Light duty paved road	Duchesne
51	Powerline	Duchesne
52	State Highway 86	Duchesne
62	Powerline	Duchesne
62	Unpaved road	Duchesne
63	State Highway 87	Duchesne
63	Unpaved road	Duchesne
64	Light duty paved road	Duchesne
66	Light duty paved road	Duchesne
66	Powerline	Duchesne
74	Light duty paved road	Duchesne
78	State Highway 208	Duchesne
79	State Highways 208 & 35	Duchesne
81	Light duty paved road	Duchesne
82	State Highway 35	Duchesne
82	Light duty paved road	Duchesne
85	State Highway 35	Duchesne
87	State Highway 35	Duchesne
87	State Highway 35	Duchesne
90	State Highway 35	Duchesne
92	State Highway 35	Duchesne
92	State Highway 35	Duchesne
93	State Highway 35	Duchesne
93	State Highway 35	Duchesne

M.P.	Name and Type of System	County
95	Light duty paved road	Wasatch
100	State Highway 35	Wasatch
104	State Highway 35	Wasatch
105	State Highway 35	Wasatch
107	State Highway 35	Wasatch
110	Unpaved road	Wasatch
115	State road 241	Wasatch
116	State Highway 35	Summit
116	State Highway 35	Summit
116	State Highway 35	Summit
117	Light duty paved road	Summit
117	Light duty paved road	Summit
119	Light duty paved road	Summit
110	U.S. Alternate 189	Summit
120	Light duty paved road	Summit
121	Powerline	Summit
121	Powerline	Summit
122	State road 34	Summit
128	U.S. Highways 40 & 189	Wasatch
128	U.S. Highways 40 & 189	Summit
129	Powerline	Summit
129	Union Pacific Railroad	Summit
130	U.S. Highways 40 & 189	Summit
132	Light duty paved road	Summit
134	State Highway 248	Summit
139	U.S. Highway 40 & Interstate 80	Salt Lake
143	State Highway 65	Salt Lake
144	State Highway 65	Salt Lake
144	State Highway 65	Salt Lake
144	State Highway 65	Salt Lake
150	Unpaved road	Salt Lake
154	Light duty paved road	Salt Lake
157	Interstate 15	Davis
157	D&RGW Railroad	Davis
157	Union Pacific Railroad	Davis
157	Powerline	Davis

Source: USDA, Forest Service, Wasatch National Forest, Chuck Madsen - Civil Engineer, 1982.

APPENDIX G

CULTURAL RESOURCE DATA

Part 1 - SOURCES OF CULTURAL RESOURCE INFORMATION RESEARCHED

Institutions

Ashley National Forest
437 East Main
Vernal, Utah 84078
Forest Cultural Resoure Records

Church of Jesus Christ of Latter-Day Saints
Administrative Offices
50 East North Temple
Salt Lake City, Utah 84138
History Division
Library Archives Division
Map Section
Microfilm Section

Daughters of Utah Pioneers Museum
Museum Library
300 North Main
Salt Lake City, Utah

Division of State History
(Utah State Historical Society)
300 South Rio Grande
Salt Lake City, Utah 84101
Antiquities Section
Map Section
Microfilm Library
Reference Library

Fort Douglas Military History Museum
Building 32, Potter Street
Fort Douglas, Utah 84113
Reference Library

U.S.D.A. Forest Service
Regional Office Archaeology Lab
Archaeology Lab
Weber State College
Ogden, Utah
Regional Cultural Resource Records

University of Utah
Department of Anthropology Lab
Salt Lake City, Utah 84112

University of Utah
University Library
Salt Lake City, Utah 84112
Map Department
Microfilm Department
Periodicals
Rare Books

Wasatch National Forest
8226 Federal Building
125 South State Street
Salt Lake City, Utah 84138
Cultural Resource Records

Weber State College
University Library
Ogden, Utah
Map Section
Microfilm Section
Periodicals
Reference Section

APPENDIX G

Part 2 - Potential Sources of Cultural Resource Information

Institutions

American Museum of Natural History
Central Park West at 79th Street
New York, New York 10024

American West Center
University of Utah Campus
Salt Lake City, Utah 84112

Brigham Young University
University Library
Provo, Utah 84602

Bureau of Land Management
170 South 500 East
Vernal, Utah 84078

Center of Military History
General Reference Branch
20 Massachusetts Avenue N.W.
Washington, D.C. 20314

Library of Congress
Washington, D.C. 20540
Manuscripts Division
Prints and Photographs Division
Technical Records Division

National Archives and Records
Washington, D.C. 20408
Interior Department Records
Navy and Old Army Records
Technical Records Division

National Historical Publications and
Records Commission
Washington, D.C. 20408

Salt Lake County Public Library
2197 East 7000 South
Salt Lake City, Utah

Smithsonian Institution
Washington, D.C. 20560
Department of Anthropology
National Anthropological Archives

U.S. Army Military History Institute
Carlisle Barracks, Pensylvania 17013

U.S. Army Records Center
Operations Archives Branch
St. Louis, Missouri

Utah Museum of Natural History
University of Utah Campus
Salt Lake City, Utah 84112

Utah State University
University Library
Logan, Utah 84021

Ute Indian Tribe
Administrative Offices
Ft. Duchesne, Utah 84026

APPENDIX G

PART 3 - CULTURAL SEQUENCE

Prehistoric Period

Paleo-Indian Tradition: The oldest, reliable radiocarbon dates indicating the presence of man the New World fall in the range of 10,000 to 9,000 B.C. and come mainly from sites found on the High Plains and in the Southwest. Dates of 10,000 to 9,000 B.C. place this cultural tradition in the Two Creeks Interstadial of the late Pleistocene. The climate at this time was cool and wet with a grassland environment existing on the plains, in the eastern U.S., and in areas of Arizona and New Mexico that are now desert.

The Paleo-Indian Tradition is also commonly called the Big-Game Hunting Tradition as a great many of the sites found during this time period were no more than kill locations where mammoth and other large animals were tracked down and slain. People during this time period were nomadic hunters and gatherers who wandered in a cyclical pattern within a given geographical area pursuing seasonal vegetation and game. Artifacts characteristic of this cultural tradition consist of large, bifacially flacked projectile points (Clovis, Folsom, and Plano points) which were used as spear tips, a variety of specialized and unspecialized scrapers, choppers, knives, drills, and other chipped tools. The Paleo-Indian Tradition ended about 8,000 to 7,000 B.C. (Willey, 1966)

Desert Tradition: Northwest and western Utah belong to a geographic area called the Great Basin. Included in this area are also eastern California, Nevada, southeastern Oregon, southern Idaho, and southwestern Wyoming. Northeast and eastern Utah belong to a geographical area known as the Colorado Plateau. The dividing line between these two geographic areas is the Wasatch Range. The earliest known cultural tradition for these areas is the Desert Tradition and, due to excavations at Danger Cave in western Utah, much is known of its earliest beginnings. Danger Cave was first occupied by man shortly after the subsidence of a Pleistocene lake which covered the Bonneville Salt Flats. According to radiocarbon dates, the first occupation of this cave occurred between 9,500 and 9,000 B.C., or during the Two Creeks Interstadial of the Late Pleistocene. The cave location is marked by fires and a few chipped stone artifacts found in the beach sand left inside the cave by the retreating lake.

True Desert Tradition cultural remains do not appear in the earliest level of the cave, but do appear in the second earliest level. This is called Zone II and has been radiocarbon dated at between 8,000 and 7,000 B.C. Cultural remains found in the Desert Tradition are in sharp contrast to those found in the Paleo-Indian Tradition. Artifacts typical of this time period consist of traps, snares, nets, manos, metates, coiled and twined basketry, and small, thick side-notched, corner-notched, stemmed, and unstemmed points that were used as tips for throwing sticks. Faunal remains found in Danger Cave indicated that mountain sheep, bison, deer, rabbit, and antelope were hunted and the presence of grinding tools indicated that seeds were being collected as early as 7,000 B.C. Other caves in Utah that have revealed evidence of a

Desert Tradition culture include Black Rock Cave No. 1 and Deadman Cave located on the south shore of the Great Salt Lake and Promotory Cave II located on the north side of the lake. (Willey, 1966)

From current archaeological evidence, it appears that until approximately 3,500 B.C., Desert Tradition sites were concentrated along the periphery of lowland lakes with the people being dependent on lake periphery resources. Between 3,500 and 1,500 B.C., there is evidence of both upland and lakeshore sites and after about 1,500 B.C. Desert Tradition sites were confined to up and areas. This move from a lakeshore to an upland cultural adaptation corresponds with changes in the weather and environment. Between 3,500 and 1,500 B.C. a neoglacial period occurred which drastically reduced lake periphery resources and improved upland environments. Fluctuations in climate would effect water availability plus the rise and fall of lakeshore lines would affect the availability of halophyte and march plant species. A fall in the shoreline would expose freshwater springs, creating march areas; a rise in shoreline would increase water salinity, thereby killing all the shoreline marsh plants. After about 1,500 B.C., pollen records indicate an increase in pinyon pine pollen in the uplands which would make this areas suitable for seed gathering. Prior to this, the now pinyon/juniper woodland was dominated mainly by juniper. (Madsen and Berry, 1975)

Currently, there is a controversy over the time and cultural relationship between the Paleo-Indian and the Desert Tradition in the Great Basin area. Since there is no conclusive strategraphic evidence showing the presence of a Paleo-Indian Tradition in Utah, the following question has arisen, "Was there ever a real Paleo-Indian Tradition in the Great Basin area?". The oldest known occupied site in Utah is Danger Cave which has a radiocarbon date of 9,500 to 9,000 B.C. recorded for its lowest occupied level (Zone I). The artifacts found in this level are of such a general nature that they cannot be placed definitely into any specific cultural tradition. By date, though, this level could be placed in the Paleo-Indian Tradition. Materials characteristic of the Desert Tradition are not found until Zone II which dates between 8,000 and 7,000 B.C. which is the end of the Paleo-Indian Tradition. One of the difficulties in determining the relationship between these two traditions is that so few Paleo-Indian points have even been found in the Great Basin. A few fluted points have been found near Tonopath, Nevada, and in the Lake Mojave area of the California Desert, but that is all. Until more examples of Paleo-Indian points are found in situ, the question of a time and cultural relationship between the Paleo-Indian and Desert Traditions will go unanswered. (Willey, 1966)

Fremont Tradition: About 500 A.D., the Desert Tradition in northern Utah began to be influenced and changed by the Anasazi culture found in southern Utah, southern Colorado, Arizona, and New Mexico. Although these cultural changes are called the Fremont Tradition in northeastern Utah and the Sevier-Fremont Tradition in northwestern Utah, they are one and the same and all shall henceforth be called collectively the Fremont Tradition in order to avoid confusion. The western most sites at which Fremont cultural remains have been found are Lovelock Cave in western Nevada and Etna Cave in extreme southeast Nevada. To the north, Fremont pottery has been found in Wilson Butte Cave in south-central Idaho. Fremont pottery and pictographs have been

found in the Flaming Gorge Reservoir areas of southwestern Wyoming. To the east, Fremont cultural remains have been found at the LoDaisKa site near Denver, Colorado and Fremont stype pictographs are reported from eastern Colorado and Wyoming.

During this time period, changes occurred in the settlement and cultural patterns of the peoples in northern Utah. Though still basically a hunting and gathering society, the Fremont people became semi-sedentary practicing agriculture in the alluvial river bottoms. Corn, beans, and squash were being grown and then stored in small, circular adobe and stone graineries, slab-lined storage pits, and pot holes located in canyon bottoms. Another major cultural change that distinguishes the Fremont from the Desert Tradition is the use of the bow and arrow and the appearance of a small side-notched point that was used for arrow tips. Though practicing agriculture, there was still a heavy seasonal dependance on waterfowl, fish, bison, antelope, and small game. Birds were also hunted for feathers to be used in feather work. Seeds, roots, and nuts were also still being gathered.

A more permanent type of house began being built with the following types becoming most common:

1) a lean-to of poles covered with cedar bark;

2) above-ground circular or rectangular structures with walls made of adobe overlaid with stones and vaulted walls roofed with poles;

3) circular or oval semi-subteranean houses that were slab-lined with the above surface portion of the house being made of adobe; and

4) caves were also lived in if available.

Baskets were of the coiled variety often being lined with gilsonite for waterproofing. A crude, plain, greyware type pottery with a rounded bottom appears during this time period along with elaborate clay figurines. Pictographs and petroglyphs also became common. By 1100 A.D., for some unknown reason, most of these Fremont cultural traits disappear and the Indians of northern Utah returned to a Desert Tradition way of life that continued up until historic times. (Dorman and Eldon, n.d.; Madsen and Berry, 1975; Willey, 1966)

Historic Period

During the beginning of historic times in North America, much of the land in and adjoining what is now known as the Great Basin areas was a Spanish possession. This included California, Nevada, Utah, the western part of Colorado, the southwest corner of Wyoming, and Texas. The earliest known recorded reference to Utah and its inhabitants appears in Spanish records of the 1540's when this area was first considered a part of El Gran Teguayo, a legendary kingdom that rivaled Coronado's fabled Quivira in its purported wealth. The Spanish had a great deal of contact with the Ute Indians, who made their home in Utah, western Colorado, and northern New Mexico. At least three known trading expeditions entered western Colorado during the 1760's and 1770's. The Spanish had set up missions in California and in 1776, the

Dominguez-Escalante Expedition tried to find a safe, new route beteween Santa Fe, New Mexico, and Monterey, California. Their expedition went from Santa Fe, New Mexico, through Colorado, and northeastern Utah as far north as Provo. Due to bad weather, short supplies, and lateness in the year, it was feared they would not be able to cross the snow-bound Sierras to reach Monterey. So they abandoned their expedition and returned to New Mexico by a more southerly route, arriving in Santa Fe on January 2, 1777. The Spanish Trail and its various side branches was a major trade route between Santa Fe, New Mexico, and southern California. The main route of the trail passed through southern Utah (Moab, Castle Dale, Richfield, St. George) with a side branch following the route of the Dominguez-Escalante Expedition through northeast Utah (Jensen, Vernal, Duchesne, Provo) before hooking up again with the main trail. The Spanish also came into Utah to recapture horses and mules that had been stolen from California by the Indians.

The eastern Utes, found in Colorado and northern New Mexico, were more nomadic and more warlike than the western Utes. They were also more friendly towards the Spanish, often being used in campaigns towards the Comanches. The western Utes, found mainly in Utah, were more gentle, sedentary, and poorer than the eastern Utes and still followed a Desert Tradition way of life. The Spanish came as far north as Lake Utah to capture the western Utes who were then traded to the Hopi or other Spanish to be used as slaves. This practice was carried on until as late as the 1850's. (Auerbach, 1941; Tyler, 1954)

During this same time period, the Shoshoni were living in what is now known as southwestern Wyoming, southern Idaho, northwestern Utah, northeastern and central Nevada. Linguistically related to the Utes, the Shoshoni were also very culturally similar to the Utes until approximately 1700. After the introduction of the horse by the Spanish into Idaho and Wyoming, a cultural split occurred amount the Shoshoni. Those living in Idaho and Wyoming that adopted horses took on the entire buckskin culture of the Plains Indians whenever possible, while the Shoshoni living in Nevada and Utah remained poor and culturally like the Utes. The modern day Gosiutes of western Utah are of the Shoshoni tribe. (Spencer et al., 1965)

Under Spanish rule, trapping and trading permits were difficult to obtain thereby discouraging the trapping industry in the territory under their control. Trappers were known to be in the Great Basin area, though, as early as 1807. In 1821, the Great Basin and its adjoining area became a Mexican possession. After this area came under the control of Mexico, permits were less difficult to obtain. Prior to 1830, muskrat and beaver fur were in great demand by European furiers to be made into hats. The less difficulty in obtaining a trapping permit combined with the high prices being paid for fur led to the rise of the trapping and trading industry in the Great Basin during the middle 1820's to late 1830's. Some of the more notable trappers in the Utah area during this time wer Antoini Robidoux, Jim Bridger, Jedidiah Smith, Etienne Provost, Hugh Glass, Jim Beckwourth, and William Henry Ashley. The summer rendezvous was started by William Henry Ashley in 1825 with a preliminary rendezvous being held on Kamas Prairie and then a second one being held later that summer at Henry's Fork of the Green River. After these rendezvous', Ashley returned to St. Louis with some of his men plus his fur caches. The furs were sold for $75,000. During the late 1820's and 1830's,

the summer rendezvous' became an annual event being held in a different location each year. Agents of the various fur companies came to meet their own parties of trappers and to arrange new contracts with the independent, free trappers. At the rendezvous, trappers were able to trade for various types of supplies. There were sixteen rendezvous held in all with the final two, 1839 and 1940, being held on the Green River.

Four important forts, which provided supplies to local trappers, were located in northeastern Utah and southwestern Wyoming. Fort Uinta was built by Antoine Robidoux about 1831 or 1832 on the west bank of the Uinta River (now known as the White Rocks River) just east of the present town of White Rocks. The fort is also known as Fort Robidoux (not to be confused with Fort Robidoux in Colorado) and as Fort Wintey. Sometime between 1844 and 1846, during one of Robidoux' journeys back east, the Ute Indians destroyed Fort Uinta and were said to have killed everyone in the fort. Fort Kit Carson was located near the confluence of the Uinta River (now the Duchesne River), the Green River, and the White River across the Green River from where Ouray, Utah is located today. Kit Carson built this fort in 1833 as a winter quarters during 1833-1834. The fort consisted of a few log cabins surrounded by an adobe wall. According to tradition, this fort was also used for a time by Antoine Robidoux and has often been called Fort Robidoux leading to some confusion between this fort and Fort Uinta.

About 1837, Fort Davy Crockett was built by Philip Thompson, William Craig, and a man named St. Claire or Sinclair. It was located on the east bank of the Green River in Brown's Hole just above where the Green River crosses the Colorado boundary line with Utah. Brown's Hole had been from early times both a camping and a rendezvous place for the Shoshoni Indians as well as a gathering place and trading point for trappers throughout the region. Fort Davy Crockett was destroyed by the Utes in the early 1840's. Fort Bridger was built by James Bridger and Pierre Louis Vasquez in 1842 along the Black's Fork River in southwester Wyoming. It remained a trading post until 1853 when it was destroyed by fire with the Mormons then taking possession.

By the late 1830's, the heyday of the trapper era was past due mainly to a decrease in demand for fur to be used in the hat industry and a decrease in fur prices. About 1830, hat styles changed and silk hats came into fashion in place of beaver and muskrat fur hats. This change in style greatly reduced the value of muskrat and beaver. In the early part of the 19th century, practically all Canadian and United States furs were sent to Europe. Most of these furs found their way first to English auctions and then a part of these, in turn, were shipped on to two fairs held at Leipsic, Germany. Fur prices for the entire world were fixed at these two fairs. About 1838, German agents started shipping furs direct from America to Leipsic and within a few years only a part of the Canadian and American furs were shipped directly to the English auctions. In 1842, the British Army discontinued their high beaver hats and replaced them with a cap which required no beaver fur. These two changes caused a further serious decline in the price of beaver fur and the trapping business. By the early 1840's, the trapping business came to an end in the American West. (Auerbach, 1941; Murphy, M., 1973; Reagan, 1935; Anonymous, n.d.a.)

In February 1848, at the end of the Mexican War, all Mexican territory north of the Rio Grande was ceded to the United States. This included California, Texas, Arizona, Nevada, Utah, New Mexico, the western part of Colorado, and the southwestern part of Wyoming. With all of the Great Basin area now a United States possession, the west was open for pioneer settlement. The first permanent, white settlers in Utah were the Mormons who began entering Utah around 1846 during the opening stages of the Mexican War. By the summer of 1847, they had settled in the Salt Lake Valley and soon began settling other areas of Utah. Between 1847 and 1900, the Mormons had founded about 500 settlements in Utah and neighboring states. A political government was formed by the Mormons and the State of Deseret (1849-1851) was created. Congress would not admit Deseret to the Union and instead created the Territory of Utah which lasted from 1851-1896. Utah was finally admited to the Union in 1896.

Due to the expanding population of white settlers moving south and east of Salt Lake City and taking over new land, the Indians were being crowded off their central settlements in Utah Valley. Indian problems surfaced in Utah in the 1850's and settlements were threatened, especially during the Walker War of 1853-1854 with the massacre of U.S. Topographical Survey party led by Lieutenant John W. Gunnison. Mormon settlement difficulties were compounded during the presidential election campaign of 1856 when national attention was focused on Utah as Republican candidates denounced both polygamy and slavery in the territories. Reports that Utahns were in rebellion against federal authority led President James Buchanan to send an expeditionary force to Utah in 1857 under Albert Sidney Johnston.

Colonel Johnston arrived in southwestern Wyoming in November 1857. Leaving his supplies at Fort Bridger, he wintered at Camp Scott located one and one-half miles south of Fort Bridger on the Black's Fork River. Tense settlers in southern Utah were caught up in an atmosphere of war hysteria after 120 immigrants bound for California were killed in the Mountain Meadows Massacre. Salt Lake Valley residents temporarily relocated in Utah Valley in 1858. Col. Johnston moved his troops on into Utah arriving in Cedar Springs south of Salt Lake City and establishing Camp Floyd, the first Utah army post. Peace was finally attained in the spring of 1858. The fort was abandoned in 1861 when forces were moved east for the Civil War and all the buildings were burned to the ground after the army left.

Fort Bridger was declared a military post in 1858 by Johnston and the following year the War Department established a military reservation of 500 square miles. Col. William Hoffman was the first commander of the fort and W. A. Carter was the first post trader. Under the direction of Col. Hoffman, the work of rebuilding the fort was started in 1857 and today many of the buildings that are still on the fort grounds were built between 1857 and 1860. Fort Bridger remained a military fort until 1890.

Fort Bridger was also an important link in the communication between east and west. By 1857, the Overland Stage was running on a daily schedule with Fort Bridger as a division point. In 1860, the Pony Express line stopped at the fort followed by the Creighton Telegraph in 1861 which connected Omaha, Salt Lake City, and San Francisco. (Anonymous, n.d.a.; Arrington, 1958; Auerbach, 1941; Murphy, M., 1973; O'Neil and MacKay, n.d.)

One of the oldest U.S. Army posts in Utah is Fort Douglas which was built overlooking Salt Lake City in 1862. Originally built as a base to subdue early Mormon raiding parties, its troops also participated in operations against the Indians. From 1874 to 1876, it was almost completely rebuilt. During the Spanish-American War and World War I, Fort Douglas served as a training base and in the two World Wars it was a POW camp for enemy soldiers. The reservation is now located on the campus of the University of Utah and is used mainly by the U.S. Army Reserve.

Brigham Young attempted to solve the problem of the dispossessed Indians by creating farms where they might be self-sufficient by white standards. The attempt failed and the people of the Territory of Utah moved to have the Indians expelled from their native areas. The first step in removal was taken during the Civil War when President Abraham Lincoln designated the Uintah Basin as an Indian reservation. The Mormons had already explored the area and deemed it undesirable for settlement. Superintendent of Indian Affairs O.H. Irish and Brigham Young attempted to work out a plan calling for the resettlement of the Utes in the Uintah Valley and the Spanish Fork Treaty of 1865 was negotiated for that purpose. Congress did not ratify this treaty but it did approve the formation of the Uintah Valley Reservation. The Indians resisted the move with their resistence being called the Black Hawk War (1865-1869). The Utah Ute Indians were finally relocated to the reservation and peace prevailed for a short time with only minor Indian outbreaks occurring in 1872 and 1876.

It was not until the Indian uprising of 1879 that the Colorado Utes were relocated to the Uintah Valley Reservation. Because of his efforts to convert them to an agricultural way of life, Indian Agent Nathan C. Meeker had become extremely unpopular with the Indians. The White River Utes (Yamparicas) rose in rebellion killing Meeker and seven employees plus capturing several women and childern. Meeker, anticipating an uprising, had asked for military help. Major Thomas T. Thornburgh was dispatched for Fort Fred Steele, Wyoming, with 200 cavalry troops to aid Meeker. The troops were attacked on route with Thornburgh and most of his command being killed. Chief Ouray of the Uncompaghre Utes also intervened to stop the uprising.

Colorado settlers were outraged by these events and demanded the removal from their state of both the White River Utes and the guiltless Uncompahgre. On June 15, 1880, Congress ratified a treaty with the White River Utes transferring them to the Uintah Valley Reservation. For the Uncompahgre, the government created a new reservation by executive order in January, 1882, to be located east and south of the Uintah Valley Reservation.

In order to protect the people living near the reservation and to make sure the Indians remained, the War Department made arrangements for establishing a new military post in the Uintah Basin. Brigadier General George Crook of the Department of the Platte ordered troops from the cantonment on the Uncampahgre, Colorado, to establish a new post named after Major Thornburgh and which would be under the command of Captian H. S. Hawkins of the Sixth Infantry. Four companies moved into the Uintah Valley during August, 1881, setting up camp at Ouray near the junction of the Green and Duchesne Rivers. The Interior Department, fearing an adverse influence on the Indians from the

troops, asked the Secretary of War to establish the new fort some distance away from the reservation. As a result, Fort Thornburgh was built in 1881 about 6.5 miles north of Vernal in the mouth of Ashley Creek Canyon.

During the winter of 1885-1886, intertribal warfare broke out among the various Ute tribes. Fort Duchesne was built in late 1886 by the War Department and was located about three miles above the junction of the Duchesne and Uintah Rivers. In the late 1890's, plans were made to lay out boundaries for a new Indian reservation. The original boundaries would be decreased with much of the original reservation land being open for general settlement by Whites. In 1898, government surveyors began laying out the boundaries for the new reservation. Each Indian was to be given an allotment of 160 acres to live on. The Indians opposed giving up their land and by late 1898, the government determined that the allotment system was unsuccessful on the Uncompahgre reservation where surveyors had already apportioned 70,000 acres. Few of the Indians showed any interest in settling on their allotted land. Most of them did not know where their plots laid and those who did, had no desire to occupy them. Washington tried to negotiate a treaty with the Ute Indians but was unsuccessful. In 1905, the new reservation was open.

By 1910, the population of Uintah County had reached 7,050, the area was well-settled; and the Indians were peaceful. It was determined that there was no military reason why Fort Duchesne should be continued as a military post. The last remaining unit at the reservation left Fort Duchesne for Fort Boise, Idaho in September 1912. After the troops left, the Bureau of Indian Affairs took over the fort and used it as their headquarters on the reservation. (Alexander and Arrington, 1965; O'Neil, 1971)

The mining, oil, and gas industry has played an important part in the history of the Uintah Basin. In the late 1880's, gilsonite was found to be located on land south and west of Vernal. Mining operation began around Gusher with the area around Bonanza following in the Early 1900's. Many mining claims for precious metals, copper, lead, and other minerals were also filed in the late 1880's on the south slope of the Uinta Mountains and in the various canyons around Salt Lake City. Most of these were small claims that were not very profitable. In the Uintah Basin area, probably the most famous, and also the most profitable, of these was the Dyer Mine located on Dyer Mountain north of Vernal. In the Salt Lake City area, the most famous and most profitable mining districts are located in Big Cottonwood Canyon, Little Cottonwood Canyon, and Parley's Canyon with the towns of Park City, Brighton, and Alta serving as centers for these mining districts. In the late 1910's, drilling for oil and gas began in the Uintah Basin with the first refinery being built at Rangely, Colorado on the White River at the present site of California Company's pipeline station. The oil and gas industry has greatly expanded in northern Utah and has come to have a major influence on the economy, planning, growth, and future of the area in general. (Anonymous, 1941; Anonymous, n.d.c,; Sabatka, 1964).

APPENDIX H

PALEONTOLOGY IMPORTANCE RATINGS AND GEOLOGICAL BACKGROUND

I. DEFINITION OF PALEONTOLOGICAL IMPORTANCE RATINGS

Importance ratings are based on the expected degree of required mitigation. Ratings are grouped into four categories:

A. High probability of important fossil occurrence. Important fossils (vertebrate, invertebrate, and/or plant) are found in formations of this category, and any excavation may uncover and destroy them. These areas must be carefully surveyed in detail by a qualified paleontologist before any excavation is done. A qualified paleontologist must be present whenever excavations are made in these formations and allowed to collect samples of any important fossil materials uncovered during excavation.

B. Medium probability of important fossil occurrence is based on one or more of the following criteria: (1) important fossils have been found in these formations in other areas; (2) there has been little work done in the formations to determine their paleontological potential; (3) the fossils found in these formations are poorly preserved and/or scarce but important when found. These areas should be spot checked before any excavation is done. If important fossils are found during the spot check then these areas would take on the same mitigation requirements as A.

C. Low probability of important fossil occurrence indicates that no field survey would be necessary in these formations unless important fossils are uncovered during excavation. If any vertebrate, invertebrate, or plant fossils are uncovered during excavation, they should be salvaged and immediately turned over to a competent paleontologist to determine their importance.

D. The negligible rating indicates that the rocks are either volcanic, highly metamorphic, or intrusive. Fossils are rarely or never found in rocks of this nature.

II. PROCEDURE

A detailed geological study as such is not presented here since such information is readily available in numerous scientific publications (Madsen, 1980). Existing geological data, however, is the basis for the importance ratings. The list of formations potentially crossed by the alternative pipeline route was prepared from the Geologic Maps of Utah, Northeast Quarter (Stokes, et. al., 1961-1962).

The pipeline route was scaled off the appropriate 1:250,000 scale geologic map and recorded noting the areal extent, cumulative lengths, and identity of the successive formational outcrops. This importance rating of the sequence of formations in the following list is sequentially presented as Profiles

(Figures 4 through 10) in main text of this report. It should be noted that the accuracy of these logs is limited by the interpretative ability of the compiler as well as the accuracy of the original fieldwork. This data indicates those areas where intensive field work will be required for protection of fossils should the alternative pipeline be constructed.

III. LIST AND RANKING OF POTENTIALLY AFFECTED GEOLOGIC FORMATIONS

The potentially affected formations along the alternative pipeline route are listed below in stratigraphic order. The importance significance and suggested mitigation categories (importance ratings) were taken from Madsen, 1980.

Symbol	Age	Name	Significance	Mitigation
Qay	Quaternary	Younger Alluvial deposits along active streams	L	C
Qas	Quaternary	Alluvial surface with soils suitable for farming	L	C
Qgs	Quaternary	Gravel surfaces, mainly terraces and pediments	M	
Qgm	Quaternary	Glaciated surface, may be rock or morraines		
Qls	Quaternary	Landslide deposits	L	
Qltg	Quaternary	Gravelly lake terraces	C	
Tap	Early Tertiary	Andesite-trachyte-latite pyroclastic	N	N
Tu	Eocene	Uinta formation	H	A
Tk	Paleocene-eocene	Knight conglomerate	M	C
Kec	Upper cretaceous	Current Creek formation	L	C
Kk	Lower cretaceous	Kelvin conglomerate	M	C
Jm	Upper Jurassic	Morrison	H	A
Jst	Upper Jurassic	Stump sandstone (Curtis equivalent)	M	C
Jp	Lower Upper Jurassic	Preuss Sandstone (Entrada equivalent)	L	C
Jtc	Middle Jurassic	Twin Creek Limestone	M	C
Jn	Lower Jurassic	Nugget Sandstone (Navajo equivalent)	M	C
Trc	Upper Triassic	Chink	M	C
Trs	Middle Triassic	Shinarump conglomerate or equivalent	M	C

Symbol	Age	Name	Significance	Mitigation
Trt	Upper Lower Triassic	Thaynes Formation or Group	M	C
Trw	Lower Triassic	Woodside Shale	L	C
Ppc	Mid to Upper Permian	Park City Formation	M	C
Pm	Upper Pennsylvanian	Morgan Formation	N	B
Pw	Upper Pennsylvanian	Weber Formation	M	C

Significance ratings -

L = Low
M = Potentially Medium
H = Potentially High
N = Negligible

Mitigation (suggested)

A =
B =
C =
N =

IV. MINING OPERATIONS ALONG TOSCO PIPELINE PROJECT

A check was made of an unpublished map held and updated by the Utah Division of Oil and Gas Mining. Only three operations were identified in the corridor from the map, as follows:

	Operation	Status
1.	Enverest Inc. Sand and Gravel Section 19, T.1N., R.8W.	Abandoned
2.	Quarry, Section 19, T.1N., R.8W.	Abandoned
3.	Monroc Incorporated Sand and Gravel, Section 6, 7, T.1N., R.1E. (Milepost 160)	Active, located at point of mountain near North Salt Lake. The line would cross through about 1/4 mile of an inactive portion of the gravel pit.

A check for active mining operations was then conducted through the CRIB Mineral Resources Computer file. This investigation was conducted by listings filed according to USGS Topographic Quadrangle map name. The following operations were identified on the Quads that would be crossed by the pipeline corridor:

1. Altamont Quad

	Operation	Status
a.	Altamont oil and gas field. T2S R5W all	Active, 10-12 miles north of pipeline route.

2. Park City East

a.	Unlimited Park City mine shafts and tunnel portals	5 miles south of Chevron Pipeline. Sec. 21, T.2S., R.4E., Sec. 24, T.2S., R.4E.
b.	Round Valley NE Quarries (Staker Paving) dimension stone and road base.	SW1/4, NW1/4 and NW1/4, SW1/4 Sec. 27, T.1S., R.4E. Approximately .3 miles north of Chevron Pipeline. Active in 1980.

3. Red Wash SW

a.	Natural Buttes Gas Field	Active, includes all of (9.8 miles) line from Tosco operation to junction with Chevron line 1 1/2 miles of Chevron route in Sections 32 and 33 of T.8S., R.22E.

4. Ouray SE

a. Gravel pit	Active, T.8S., R.20E., Sec. 31, approximately 7-8 miles south of pipeline route.

5. Kamas

a. Sand and gravel pit	Active, Sec. 24, T.1S., R.5E., approximately 6 miles north of Chevron line.

6. Francis

a. Sand and gravel pit	NW1/4, NE1/4, SE1/4 Sec. 32, T.2S., R.6E. Approximately .6 miles south of pipeline route.

7. Salt Lake City

a. Gravel pits	NE1/4, NE1/4, SE1/4 Sec. 11, T.1N., R.1W., and SE1/4, NE1/4, NE1/4 Sec. 14, T.1N., R.1W. Approximately 1/2 mile north and south of Mtn. Fuel gas pipeline.

8. Duchesne NE

a. Duchesne oil and gas field	Active, top of Blue Bench, Sec. 7, 8, 9, 15, 16, 17, 18, and 28, T.3S. R.4W. About 4 miles of pipeline route (MP 58-62), 4-8 producible wells.

9. Duchesne

a. Sand	Periodically active, SE1/4, NW1/4, NE1/4 Sec 11, T.4S., R.5W. About 2,000' south of Duchesne Cemetery, about 9 miles south of pipeline route.
b. Sand and gravel	SW1/4, NW1/4, NE1/4 Sec. 36, T.3S., R.5W. 1.1 miles SW Duchesne Municipal Airport, 6 miles south of pipeline route.
c. Starvation oil and gas field	Sections 32, 33, 34, 3, 4, 5, T.3S. & 4S., R.5W. 3 working wells. MP 65-66 1 mile from pipeline route.

10. Brennen Basin

a. Brennen Bottom oil and gas field	Active, Sections 16, 17, 18, 19, and 20, T.7S., R.21E., also, Sections 13 and 14, T.7S., R.20 . All about 4 miles north of Chevron route.

11. Wolf Creek
Hanna
Raspberry Knoll
Tabby Mountain

a. Coal	Inactive coal operation at Red Creek on Ute Tribal ceded coal properties - Sections 22, 23, 26, 27, T.1S., R.9W.

V. GEOLOGIC FAULTS ALONG THE TOSCO ALTERNATIVE PIPELINE ROUTE

Geologic faults were identified from the Geologic Maps of Utah (Northeast and Northwestern Quarters) compiled by Stokes, et. al. (1961-1962).

Milepost	Type of Fault
89.4	Known fault .75 miles north of Hanna, 1 crossing
93.4-95	Crosses known fault on 2 crossings and single crossings of 2 additional known faults
132	Inferred fault on Quarry Mtn., 1 crossing
135.4	Known fault about 2 miles north of Snyderville, 1 crossing
138.4	Known fault between Kimball Junction and Parleys Summit, 1 crossing
144-145	Crosses 2 known faults, 1 crossing each
151	Fault covered by alluvium on NE portion of SLC, 1 crossing
153	Known fault north of City Creek Canyon, 1 crossing
157	Known fault immediately on east side of I-15. Salt Lake Valley Wasatch fault covered with alluvium, 1 crossing.

According to Earl P. Olsen, Regional Geologist for the U.S. Forest Service, the high mountain faults in the Wasatch Mountains are estimated to have been inactive for several million years. Dr. Cluff of the USGS has studied the Wasatch Fault zone near the Salt Lake Valley floor and reported that they have experienced movement 1-3 times in the past 2,000 years. Risk is estimated at 1 chance of movement in the next 50 years. Two faults along the alluvium of Salt Lake Valley would be crossed, one at milepost 176 near the University of Utah campus and another at milepost 160 on the east side of Interstate 80. These statements are based on the 1970 Studies of the Wasatch Fault by Dr. Cluff of the USGS. Copies of his study report are available at the Utah State Geological Survey.

APPENDIX I

SOIL EROSION AND EROSION CONTROL ANALYSIS

USDA Soil Conservation and Forest Service soil survey maps were inventoried to identify soil types and terrain. Map scales varied from 1:20,000 to 1:31,680. A worksheet was used to record (1) soil series and associated association descriptions (including depth, drainage, texture, parent material, and physiographic position; (2) slope range; (3) erosion hazard (wind and water); (4) additional comments concerning soil characteristics affecting construction activities and revegetation potential; and (5) climatic data (including annual precipitation and length of frost free season).

Selective soils (representing significant conditions in the Uinta and Wasatch Mountain and Plateau pipeline corridor areas) were analyzed.

NOTE: It was assumed that soils with significant conditions in the Uintah Basin area of the pipeline corridor were analyzed as part of the Regional and Site-Specific Uintah Basin Synfuels project analysis.

The soils and conditions presented in Table I-1 represent soils classified with high erosion or slide/slump hazards. The table also identifies the effectiveness of a mulch control measure to control soil loss.

Soil erosion losses were estimated by the use of the universal soil loss equation (USLE) as applicable to Western forests and woodlands (see Table I-1 footnotes). Erosion rates shown in Table I-1 for exposed soil and straw mulch would exceed the soil loss tolerance levels for both soils (see Table I-1 footnotes).

A detailed site-specific erosion control plan would be developed as part of the construction, operation, and maintenance plan for the pipeline. This plan would include locally recommended techniques and measures tailored to the conditions encountered. These measures (along with the Erosion Control, Revegetation, and Restoration Guidelines presented in Appendix J) would minimize adverse soil impacts and expedite the restoration period.

Table I-1

Water Erosion Rates Associated With Current and Exposed Soil Conditions and With A Soil Mulch Erosion Treatment

Soil and Site Condition	Erosion Rates (tons/acre/year)[a] Current Condition	Exposed[b] Soil	Straw Mulch 1.5 tons/ac	Soil Loss[d] Tolerance (tons/ac/yr)
Soil Group 1				
(MP 100-101) Typic cryoboralf; loamy-skeletal, 18-25 inches annual precipitation, 40% slope, 50 foot slope, 85% cover; 35 inch soil depth over shale.	.16[c]	22.2	5.8	2
Soil Group 24				
(MP 147-149) Lithic xerorthent; loamy-skeletal, 18-25 inches annual precipitation, 45% slope, 50 foot slope length, 65% cover; 18 inch soil depth over limestone - Emigration Series.	1.0[c]	5.8	3.4	1

(a) Based on Universal Soil Loss equation calculations as presented in--

- U.S. Department of Agriculture, Soil Conservation Service 1977. Technical Notes for Estimating Sheet - Rill Erosion and Sediment Yield on Disturbed Western Forests and Woodlands, Woodland No. 10, West Technical Service Center, Portland, Oregon; and

- U.S. Department of Agriculture, Soil Conservation Service 1977. Procedure for Computing Sheet and Rill Erosion on Project Areas, Technical Release No. 51, Engineering Division and Ecological Sciences and Technology Division, Washington, D.C.

(b) Represents completely bare soil in a loose condition during construction activities.

(c) No erosion control structures used to reduce slope length.

(d) Based on Soil Loss Tolerance calculations as presented in--

- U.S. Department of Agriculture, Soil Conservation Service 1977. Aids for Estimating Soil Erodibility - "K" Value Class and Soil Loss Tolerance, Utah.

APPENDIX J

EROSION CONTROL, REVEGETATION, AND RESTORATION GUIDELINES
(Mitigation measures for vegetation, soils, and agriculture)

EROSION CONTROL, REVEGETATION, AND RESTORATION GUIDELINES (Mitigation measures for vegetation, soils, and agriculture)

The following guidelines would be included as stipulations in the right-of-way grant issued to Tosco.

During the construction phase of the project, the applicant's representative would provide: (1) liaison with Federal agency officials; (2) expertise to direct applicable restoration procedures, where special conditions are encountered without causing construction delays; and (3) favorable public relations.

Standard procedures for the Salt Lake City Alternative Product Pipeline would include implementation of erosion control and revegetation measures to assure that lands disturbed by construction activities would be restored to a stable, productive, and aesthetically acceptable condition. Implementation of these procedures would be under the direction of the authorized officer.

A detailed, site-specific reclamation plan would be developed and become part of the operation plan. Because the alternative right-of-way is composed of many types of terrain, soils, vegetation, land uses, and climatic conditions, the detailed plan would include sets of techniques and measures tailored to each condition encountered. Local expertise and locally effective reclamation methods would be followed when the site-specific procedures for the detailed reclamation plan are developed. The erosion control, revegetation, and restoration guidelines and plan would be implemented under the direction of the authorized officer.

Technical assistance and approval of written plans for Federal lands would be obtained from the Bureau of Land Management and the U.S. Forest Service prior to any construction.

General erosion control and restoration measures would be developed for the following areas and would be included as part of the Operating Plan:

- Right-of-way and Site Clearing
- Trenching and Preservation of Topsoil
- Backfilling and Grading
- Land Preparation and Cultivation
- Revegetation
- Maintenance and Monitoring
- Use of Biochemicals

Right-of-Way and Site Clearing

Emphasis would be placed on protecting existing vegetation and minimizing disturbance of the existing environment.

- Land grading would be done only on the area required for construction.
- Sidehill cuts would be kept to a minimum to ensure resource protection and a safe and stable plane for efficient equipment use. The authorizing agency would provide assistance and would approve sidehill cuts prior to construction.
- Existing ground cover such as grasses, leaves, roots, brush, and tree trimmings would be cleared and piled only to the extent necessary. All slash would be piled and later shredded and chipped for use in restoration operations or disposed of at the discretion of the authorized officer.
- Trees and shrubs on the right-of-way that are not cleared would be protected from damage during construction.
- Where the right-of-way crosses streams and other water bodies, the banks would be stabilized to prevent erosion. Construction techniques would minimize damage to shorelines, recreational areas, and fish and wildlife habitat.
- Care would be taken to avoid oil spills and other types of pollution in all areas including streams and other water bodies and in their immediate drainage areas. All spills would be immediately cleaned up.
- Design and construction of all temporary roads would be based on an approved transportation plan and would ensure proper drainage, minimize soil erosion, and preserve topsoil. After abandonment, these roads would be closed and areas restored without undue delay or maintained at the discretion of landowners. Restoration, including redistribution of topsoil, would be to the satisfaction of regulatory officials.
- During adverse weather conditions, as determined by the onsite reclamation specialist, stop and start orders would be issued to prevent rutting or excessive tracking of soil and deterioration of vegetation in the right-of-way area.
- During construction activities near streams or lakes, sedimentation (detention) basins and/or straw bale filters would be constructed to prevent suspended sediments from reaching downstream watercourses or lakes, as required by the authorized officer.
- Actual construction activities would immediately follow clearing operations (unless specified otherwise by the authorized officer), especially in areas of soil that are highly susceptible to wind or water erosion and other special areas.

Trenching and Preservation of Topsoil

Trenching methods and techniques would ensure that:

- Topsoil would be removed from the trench area by double-ditching (i.e., windrowed separately, protected, and replaced last during backfilling). This procedure would be followed as specified by the authorized officer.

- Remaining unearthed materials would be removed and stored in a manner that facilitated backfilling procedures, uses a minimum amount of right-of-way area, and protects the excavated material from vehicular and equipment traffic.

- Cofferdams or other diversionary techniques would be used where necessary to permit flow in one part of a stream while pipelaying construction occurs in another part.

- A specific trenching and excavated material stockpiling procedure would be used on steep-sloping and rough, broken terrain to ensure minimum disturbance as outlined in an operations plan. This specific trenching and excavation procedure would be developed by both the authorized officer and applicant.

Backfilling and Grading

The following backfilling and grading techniques would be used:

- Backfill would be replaced in a sequence and density similar to the preconstruction soil condition.

- Backfilling operations would be conducted as in such a manner to minimize further disturbance of vegetation. Backfill and material compaction control operations would follow site specific guidelines established by the authorized officer. These backfill and material compaction control guidelines would be part of the operations plan.

- The contour of the ground would be restored to permit normal surface drainage.

- In strongly sloping and steep terrain, erosion control structures such as water bars, diversion channels, and terraces would be constructed to divert water away from pipeline trench and reduce soil erosion along the right-of-way and other adjoining areas disturbed during construction.

- All structures such as terraces, levees, underground drainage systems, irrigation pipelines, and canals would be restored to preconstruction conditions so that they would function as originally intended.

- The surface would be graded to conform to the existing surface of the adjoining areas except for a slight crown over the trench to

compensate for natural subsidence. In cropland areas, especially border and furrow irrigated cropland, the soils would be compacted and the crown would be smoothed to match the bordering area to allow surface irrigation.

- Topsoil would be replaced over the trench fill and other disturbed areas to restore productivity to its preconstruction condition.

- Materials unsuitable for backfilling or excess backfill material would be disposed of as arranged by the authorized officer.

- Temporary work space areas used at stream and highway crossings and other special sites would be restored to approximate preconstruction conditions and to the satisfaction of the authorized officer.

- The right-of-way at stream crossings would be restored to a preconstruction state. The upland areas and banks would be revegetated to preconstruction conditions. Where this is not possible, they would be mulched with rock. The size of the rock mulch would be larger is diameter than materials excavated from the trench. The sreambed would be returned to its original contours with sediments like those that were excavated.

Land Preparation for Seeding and Cultivation

Construction, backfilling, and grading activities commonly cause compaction and alter soil conditions that affect soil productivity and/or seeding success in the right-of-way area. The following practices and techniques would be used to improve these soil conditions, protect soil from erosion, and provide a favorable seedbed:

- In cropland areas, as required by authorizing agency, subsoiling or chiseling would be used to ensure that soil compaction is reduced and preconstruction soil permeability is restored.

- Chiseling would be used, unless objected to by the authorized officer, in range land areas to reduce compaction and improve soil permeability. Pitting and contour furrowing as directed by the authorized officer would be done on steeper slopes of disturbed areas to increase infiltration and to reduce runoff and erosion.

- Suitable mulches and other soil stabilizing practices would be used on all regraded and topsoiled areas to protect unvegetated soil from wind and water erosion and to improve water absorption.

- Special mulching practices or matting would be necessary in critical areas where wind and water are serious erosion hazards to protect seeding, seedlings after germination, and plantings.

- Commercial fertilizers would be applied to soil areas with low inherent fertility to maintain crop yields and establish grass seedings. Appliation rates would be commensurate with annual precipitation and available irrigation water.

- Seedbed for areas seeded to grass would be prepared to provide a firm and friable condition suitable for the establishment of grass stands.

- Rock mulches would be used in steep-sloping rock outcrop areas and low precipitation areas to reduce erosion and promote vegetal growth.

- Cultivation and land preparation operations on steeply sloping areas would be done on the contour to minimize erosion.

- Soil areas with rock fragments, such as very coarse gravel, cobble, or stone scattered on the surface, would be restored to the original preconstruction surface condition to blend with the adjoining area, to avoid a smooth surface right-of-way area, and to control accelerated erosion.

Revegetation (Reseeding and Planting)

The loss of vegetation from lands disturbed by pipeline construction can be mitigated only by satisfactory revegetation. To ensure a successful revegetation program, methods and procedures would be consistent with local climate and soil conditions and would follow recommendations and directions of local experts. Revegetation efforts would be continued until a satisfactory vegetative cover is established. The following practices and techniques would be used in areas where reseeding is suitable as determined by the authorized officer:

- A firm seedbed would be prepared prior to seeding. This could include a mulch of plant residues or other suitable materials. A cover crop may be needed in larger disturbed areas.

- Seed would be planted by drilling, broadcasting, or hydroseeding. Drilling is the preferred method, because it is usually most successful.

    - Drill seeding with a grass drill equipped with depth bands would be used where topography and soil conditions allow operation of equipment to meet the seeding requirements of the species being planted.

    - Broadcast seeding would be used for inaccessible or small areas. Seed would be covered by raking or harrowing.

    - Hydroseeding would be done in areas determined by the reclamation specialist or authorized officer.

- Only species adapted to local soil and climatic conditions would be used. Generally, these would be native species. However, introduced species may be considered for specific conditions when approved by the regulatory authority. Seeding rates in critical area plantings and generally throughout the right-of-way would be increased 100 percent over regular seeding to allow for seed mortality due to adverse growing conditions.

- Seed testing will be conducted to meet State, Federal, and agency seed requirements.

- Seeding would be done when seasonal or weather conditions are most favorable, and as determined by the authorized officer.

- Grazing or mowing would be delayed at least one season after seeding to provide time for vegetation to become established, especially in highly erodible areas, unless otherwise directed by the authorized officer. Protective fencing may be necessary in special areas and will be constructed, maintained, and removed according to authorizing agency specifications.

- In areas of low annual precipitation (generally less than 8 to 10 inches), where reseeding is not suitable or as successful, erosion control structures and measures would be applied on sloping areas to reduce accelerated erosion, to allow reestablishment of preconstruction surface soil conditions, and to allow natural revegetation.

- Trees and shrubs would be reestablished in areas as specified in the revegetation plan. Forest Service personnel would utilize instructions in the USFS Range Seeding Equipment Handbok for transplanting shrubs on sloping land.

- Temporary and/or permanent structures would be installed by the company at specific locations along the right-of-way and other disturbed sites to prevent off-road vehicle access.

Forest Service personnel have divided the pipeline corridor into three broad vegetation zones as it passes through the higher elevation areas of the Uinta National Forest: (1) Aspen conifer mixture; (2) Sub-alpine herbland; and (3) Big Sagebrush-mountain brush. Plants suggested for re-seeding in disturbed areas in these zones are shown in Table J-1. These suggested species provide dual benefits of wildlife forage and cover along with soil stabilization.

Table J-1

Suggested Plant Species for Re-seeding of the Chevron Pipeline Corridor Within the Uinta National Forest

Zone	Species	Pounds/Acre[b]
1.	Aspen-conifer mixture	
	Smooth brome [a] (Bromus inermis)	3
	Mountain brome (Bromus marginatus)	2
	Orchard grass [a] (Dactylis glomerata)	1
	Intermediate wheatgrass [a] (Agropyron intermedium)	2
	Alfalfa (ladak) [a] (Medicago sativa)	2
	Sweet anise (Osmorhiza occidentalis)	1
	Chickpea milkvetch [a] (Astragulus cicer)	1
	Mountain lupine (Lupinus alpestris)	1
	Showy goldeneye (Viguiera multiflora)	1
	Snowberry (Symphoricarpos oreophilus utahensis)	1
	Woods rose (Rosa woodsii)	1
	Elderberry (blue and/or red) (Sambucus caerulea/racemosa pubens microbytrys)	1
2.	Sub-alpine herbland	
	Meadow foxtail [a] (Alopecurus pratensis)	1

Table J-1 (cont'd)

Zone	Species	Pounds/Acre
	Smooth brome (Bromus inermis)	3
	Slender wheatgrass (Agropyron trachycaulum)	2
	Mountain brome (Bromus marginatus)	2
	Orchard grass [a] (Dactylis glomerata)	1
	Intermediate wheatgrass [a] (Agropyron intermedium)	2
	Kentucky bluegrass (Poa pratensis)	2
	Mountain lupine (Lupinus alpestris)	2
	Chickpea milkvetch [a] (Astragulus cicer)	2
	Sweet anise (Osmorhiza occidentalis)	1
	Snowberry (Symphoricarpos oreophilus utahensis)	1
	Woods rose (Rosa woodsii)	1
	Silver sage (Artemesia cana)	1
3.	Big Sagebrush-mountainbrush	
	Bluebunch wheatgrass (Agropyron spicatum)	1
	Intermediate wheatgrass [a] (Agropyron intermedium)	1
	Pubescent wheatgrass [a] (Agropyron tricophorum)	1

Table J-1 (cont'd)

Zone	Species	Pounds/Acre
	Smooth brome [a] (Bromus inermis)	2
	Alfalfa (ladak) [a] (Medicago sativa)	1
	Utah Sweetvetch [a] (Astragulus cicer)	1
	Arrowleaf balsamroot (Balsamorrhiza sagittata)	0.5
	Small burnet [a] (Sanguisorba minor)	0.5
	Yellow sweet clover [a] (Melilotus officinalis)	1
	Antelope bitterbrush (Purshia tridentata)	2
	Utah serviceberry (Amelanchier utahensis)	1
	Birchleaf mountain mahogany (Cercocarpus montanus)	1
	Curlleaf mountain mahogany (Cercocarpus ledifolius)	1

a These species are non-native, but most have been introduced to the area and are along the existing Chevron oil pipelines; they are included for their adaptability and because they have proven successful in establishment of vegetative cover and stabilization of the kinds of sites involved.

b The pounds/acre figures are optional and as shown represent optimum seeding rates for obtaining watershed stabilization and for providing wildlife and domestic livestock forage. National Forest personnel would use the Intermountain Region Non-Structural Range Improvement Handbook (USFS) as a guideline in establishing seeding rates.

Source: USDA, Forest Service, Uinta National Forest, Heber Ranger District, 1982.

Maintenance and Monitoring

Joint inspection of the right-of-way by the applicant or authorizing agency would be conducted to monitor the success and maintenance of erosion control measures and revegetation programs on disturbed lands for two growing seasons, or for a period determined by the authorized officer. The monitoring program would identify problem areas and corrective measures to ensure vegetation cover and erosion control. Certifiation of successful revegetation and erosion control would be determined by the authorized officer.

Use of Biochemicals

The use of biochemicals such as herbicides, fungicides, and fertilizer would comply with State and Federal laws, regulations, and policy regarding the use of poisonous, hazardous, or persistent substances. State and Federal wildlife agencies would be contacted if application of any of these substances would be on or near sensitive wildlife areas. Federal agencies would be contacted if application of these substances would be on or near recreation sites and other areas of high human use.

Application of these substances would be by ground methods. Prior to the use of such substances on or near the permit or grant area, the applicant would obtain approval of a written plan for such use from the authorized officer and appropriate wildlife agency. The plan would outline the kind of chemical, methods of application, purpose of application, and other information as required, and would be considered as the authorized procedure for all applications until revoked by the authorized officer or appropriate wildlife agency. This plan will become part of the operation and construction plan.

Construction Timing

Irrigated Cropland--Pipeline construction activities would be timed, as possible, to avoid disruption of irrigation delivery systems during the major irrigation season, to reduce effects on crop production in areas of construction as well as adjoining irrigated cropland areas served by the systems.

APPENDIX K

SOIL CHARACTERISTICS LIMITING PROJECT ACTIVITIES

General soil association data (Soils of Utah) was used to develop an overivew of the diversity of soils within the alternative pipeline area. Soil serves information was extracted from SCS and Forest Service Soils Publications and correlated with the appropriate soil associations.

Table K-1 represents the approximate occurrences and extent of soil series, by mileposts. The table identifies representative soil characteristics for soil series, including potential limitations to pipeline construction activities.

The grouping of soil associations (with narrative) identified in the text and in Table 5 were prepared from Table K-1. It should be noted that the soil characteristics may not apply to all soils within the one-mile-wide study corridor by mileposts, but they are to be considered as representative.

Table K-1

Soil Characteristics Limiting Project Activities

Soil Series Symbol	MP	Miles	Soil Characteristics
BcA [a] AeA YaA GbA SfB ZbB RuF	0 - 33.9	33.9	D-H, LRP, S, SK
Rlp [a] Pb So	33.9 - 42.0	8.1	D-H, LRP, R, SH, S
Mc [a] Mg Mk	42.0 - 47.9	5.9	D - - -
Go [a] Gm Gg	47.9 - 48.9	1.0	D - D
Nll [a] Cg	48/9 - 49.3	0.4	D - - -
Cg [a] Bd	49.3 - 51.3	2.0	D - D
Nlm [a] Ma N2e Fk Nlh Fn	51.3 - 63.4	12.1	D - S, LRP
Cp [a] Nm Nf Nz Nla Nb Nh Na Nlu Tb Mn	63.4 - 90.4	27.0	D - - -

Table K-1 (cont'd)

Soil Series Symbol	MP	Miles	Soil Characteristics
Te [a] Mt Ab Gc Mx	90.4 - 93.9	3.5	M -
S15 [b] Sc4 Ls1	93.9 - 97.3	3.4	M - H, LRP, SH, T
GC5 [b] SC12 GM7	97.3 - 109.4	12.1	M - H, LRP, T (Shallow Soils from MP 102 - 109.4)
[c]	109.4 - 110.9	1.5	MV - - -
Soils Series Symbol not Available	110.9 - 111.4 111.4 - 121.8	0.5 10.4	M - H, LRP, SH MV - SH, SK
AgD [d] OmF LmD HnF	121.8 - 131.9	10.1	M - SH, SK
EkA [d] AmD	131.9 - 134.4	2.5	MV - D
MbE [d] AoD BnG	134.4 - 138.9	4.5	M - SH
HGG [e] HHT PCG EMG	138.9 - 148.9	10.0	M - H, T
Sp [e]	148.9 - 149.9	1.0	M - H, SK
DPE [e] HHF HGG	149.9 - 160.0	10.1	M - H, T

Footnotes for Appendix K, Table K-1

[a] Soil series information for MP's 0 - 26.0 obtained from Garth Leishman, Soil Conservation Service (Leishman 1982).

Soils series information for MP's 26.0 - 94.0 obtained from Soil Conservation Service publication - Soil Survey, Roosevelt/Duchesne Area. (See General Reference Section of References Cited.)

[b] Soil information for MP's 94.0 - 109.4 from Douglas Muir, U.S. Forest Service (Muir 1976).

[c] Soil information for MP's 109.4 - 121.8 obtained from Rocky Mountain Pipeline Project, EIS Technical Report for Soils and Agriculture, Bureau of Land Management. (See General Reference Section of References Cited.)

[d] Soil series information for MP's 121.8 - 139.0 obtained from Soil Survey and Interpretations, Parleys Park Portion of Soil Survey and Summit Valley, Summit County, Utah, Soil Conservation Service. (See General References Section of References Cited.)

[e] Soil series information for MP's 139.0 - 160.0 obtained from Soil Survey of Salt Lake Area, Utah, Soil Conservation Service. (See General References Section of References Cited.)

The code arrangement and code symbols for Soil Characteristics are identified as follows:

(1) First symbol indicates Soil Setting

M - Mountains and Foothills

MV - Mountain Valley area

D - Dry climate areas generally less than 8 to 10" ppt.

(2) Remaining symbols indicate Major Soil Properties, including terrain features.

D - Drainage (poorly drained)

H - High erosion hazard

LRP - Low revegetation potential

S - High salinity and alkalinity

SH - Shallow soil depth

SK - Soils with more than 35% coarse fragments in soil profile

T - Slopes and topography (20 - 70%+)

APPENDIX L

ANALYSIS OF HAULING STEEL PIPE

1) 12" diameter, 49#/ft, 0.375" thick
2) 12" diameter steel pipe, 65#/ft, 0.5" thick
3) 12" diameter, 96#/ft, 0.75" thick

A semi-trailer load is estimated at 40 tons maximum.

1 @ 49#/ft:

one 20' length weighs 980#
truck @ 8' wide = 8 pipes per layer = 7,840 lb.
= use 5 layers x 8 pipes/layer x 2 lengths (40')
= 80 lengths of pipe or 1600 feet per truckload
= 78,400 lb.

2 @ 65#/ft:

one 20' length weighs 1300#
truck @ 8' wide = 8 pipes per layer = 10,400 lb.
= use 4 layers x 8 pipes/layer x 2 lengths (40')
= 64 lengths of pipe or 1280 feet per truckload
= 83,200 lb = reduce by 3 lengths = 79,300 lb.
= 61 lengths of pipe or 1220 feet per truckload

3 @ 96#/ft:

one 20' length weighs 1920#
truck at 8' wide = 8 pipes per layer = 15,360 lb.
= 5 layers total or 2 layers and 3 layers x 8 pipes/layer x 2 lengths (40')
= 40 lengths = 800 feet - can get 41 lengths for 820 feet per truckload
= 78,720 lb.

To keep stresses in the steel pipe walls to 12,000 psi (estimated allowable stress for 36,000 psi steel) the 0.75" thick pipe can take 1500 psi pressure, the 0.5" thick pipe can take 1000 psi, the 0.375" thick pipe can take 750 psi. For oil (Specific Gravity 0.9) there would be 390 psi difference for each 1000 feet elevation change. This implies about 3800 feet of pressure could be allowed on the 3/4" thick pipe, 2,600 feet of pressure could be allowed on the 1/2" thick pipe, and about 1950 feet is allowable on the 3/8" thick pipe. This information is used to determine the number of truckloads required to haul the pipe as follows:

It was determined from a profile of the pipeline where the various thicknesses of pipe are required due to pressure requirements.

Milepost	Pipe Thickness	Total Miles	Truckloads
0 to 65	0.375	65.0	318
65 to 93.4	0.75	28.5	184
93.4 to 95.4	0.50	2.0	8
95.4 to 160.0	0.375	64.6	206

Using the shortest distance from Provo, Utah, to the pipeline route, it was found that for pipe to be placed within the respective mileposts, the truck hauls would travel the following routes:

For Pipe Placed MP	Hauled Over Highways	No. of Truckloads*
2 to 87	189 and 40	460
87 to 141	189 and 40	200
141 to 160	I-15	56

* The number of truckloads in this column is derived from the figures in the above table. The loads were proportioned by the number of miles of the respective pipe sizes within the respective mileposts.

The haul routes shown are those major highways that would be used. Secondary State Highways and County Roads that would or could be used for pipe haul were not listed; for example, pipe placed between MP's 2 and 87 would probably be hauled over Utah State Highway 88 and BIA/Uintah County Highway 26 as well as over Highway 189 and 40.

Source: USDA, Forest Service, Wasatch National Forest, Chuck Madsen - Civil Engineer, 1982.

APPENDIX M

MONTHLY/DAILY PERCENT OF TRAFFIC USE: U.S. HIGHWAY 189 MAJOR HIGHWAY USED FOR PIPE HAUL

	Average Monthly Percent of Use[1/]		Average Daily Percent of Use[1/]
January	76.6	Sunday	110.3
February	83.7	Monday	88.3
March	79.6	Tuesday	81.9
April	75.8	Wednesday	82.2
May	87.1	Thursday	86.7
June	141.5	Friday	107.2
July	151.1	Saturday	143.5
August	141.9		
September	122.1		
October	104.2		
November	70.9		
December	65.6		

1/ Based on annual average daily traffic use of U.S. Highway 189 being 5,174.

U.S. Highway 189, Provo Canyon Road. Permanent traffic counter station located 6.1 miles northeast of Olmstead Junction on U.S. Highway 189.

Source: Utah Department of Transportation, Traffic on Utah Highways, 1979.

MONTHLY/DAILY PERCENT OF TRAFFIC USE: U.S. HIGHWAY 40 MAJOR HIGHWAYS USED FOR PIPE HAUL

Average Monthly Percent of Use[1/]		Average Daily Percent of Use[1/]	
January	46.5	Sunday	114.0
February	53.0	Monday	86.6
March	60.4	Tuesday	78.6
April	70.5	Wednesday	82.8
May	93.1	Thursday	87.9
June	151.8	Friday	118.7
July	167.8	Saturday	131.5
August	152.9		
September	128.9		
October	135.8		
November	80.9		
December	59.0		

1/ Based on annual average daily traffic use of U.S. Highway 40 being 2,184.

U.S. Highway 40, Daniels Canyon Road. Permanent traffic counters station located 3 miles southeast of Heber City on U.S. Highway 40.

Source: Utah Department of Transportation, Traffic on Utah Highways, 1979.

APPENDIX N

VISUAL RESOURCE ANALYSIS CHART

Milepost	KOP	Scenic Area Description Area	VRM Class and/or VQO	Duration of Impact	Chance for Significant Contrast	Feature Affected	Estimated Contrast Rating Score	Change in Class	Estimate Scenic Class	Estimate Visual Zone	Estimate Sensitivity
Tosco to Chevron Line		*		**			***				
0 - 5.2	White River	1	4	long	L		--		C	SS	L
5.2 - 8.3	Scenic Area	1	3	long	L		--		B	FG	M
8.3 - 9.8	White River	1	4	long	L		--		C	SS	L
Chevron Corridor											
9.8 - 19	White River	1	4	long	L		--		C	SS	L
19-20.2	Green River	2	3	short	M	Vegetation	15	No	B	FG	M
20.2 - 21.2	Hwy 88	2	4	long	L		--		C	SS	L
21.2 - 23.2	Hwy 88	2	4	long	L		--		C	FG	M
23.2 - 47.4	Roadlett-Myton Hwy 88 & 40	2	4	short 51-57/ long 57-70.5	L		--		C	SS	L
47.4 - 49	Duchesne River Hwy 40	2	3	short	M	Vegetation	11	No	C	FG	H
49 - 62.4	Bridgeland Hwy 86 & 40	2	4	short	L		--		C	SS	L
62.4 - 79	Duchesne River Utah	3	4	short	L		--		C	FG	M
79 - 94.3	Hwy 208 & 35, Tabiona, Hanna	3	3	short	L		--		C	FG	H
94.3 - 95.5	Hwy 35	3	4	long	M		--		C	SS	L
95.5 - 100	Wolf Creek	3	M	long	H	Land vegetation	****	Yes			
100 - 102.1	Wolf Creek Summit	3	PR	long	M	Vegetation	****	Yes			
102.1 - 103.5	Wolf Creek Summit	3	M	short	L		--				
103.5 - 107	South Fork of Provo River	3	R	long	M	Land vegetation	****	Yes			
107 - 108.4	South Fork of Provo River	3	PR	short	L		--				
108.4 - 115.1	Hwy 35 & Woodland	3	2/R	short	L	Vegetation	****	Yes			
115.1 - 115.5	Hwy 35	4	3	short	L		--		C	FG	H
115.5 - 120	Hwy 35 & Francis	4	4	short	M		--		C	FG	M
120 - 120.2	Hwy 189	4	3	short	L		--		B	FG	M

APPENDIX N (cont'd)

Milepost	KOP	Scenic Area Description Area	VRM Class and/or VQO	Duration of Impact	Chance for Significant Contrast	Feature Affected	Estimated Contrast Rating Score	Change In Class	Estimate Scenic Class	Visual Zone	Sensitivity
119.2 - 121	Hwy 189	4	3	short	M	Land vegetation	13/15	No	B	MG	L
121 - 122.3	Hwy 189	4	3	short	M	Land vegetation	13/15	No	B	FG	M
122.3 - 127	Hwy 40	4	4	short	M		--		C	SS	M
127 - 129	Hwy 40	4	3	short	H	Vegetation	11	No	C	FG	H
129 - 130	Hwy 40	4	4	short	M		--		C	SS	H
130 - 130.6	Hwy 40	4	3	short	L		--		C	FG	H
130.6 - 135.4	Hwy 40	4	3	short	L		--		B	SS	H
135.4 - 136	I-80	4	3	short	L		--		B	FG	H
136 - 137	I-80	4	3	short	L		--		B	SS	H
137 - 137.5	I-80	4	2	short	M	Vegetation	19	Yes	B	FG	H
137.5 - 142.4	I-80	5	3	short	M	Vegetation	11	No	C	FG	H
142.4 - 143.7	I-80 & Hwy 65	5	2	short	M	Vegetation	11	No	B	FG	H
143.7 - 144	Hwy 65	5	4	short	M		--		C	SS	H
144 - 145	Hwy 65	5	3	short	M	Vegetation	11	No	C	FG	H
145 - 146.4	Hwy 65	5	4	short	M		--		C	SS	H
146.4 - 147.2	Hwy 65	5	3	short	M	Vegetation	11	No	C	FG	H
147.2 - 148.4	Hwy 65	5	3	short	M		--		C	SS	H
148.4 - 149.2	Hwy 65	5	3	short	M	Vegetation	11	No	C	FG	H
149.2 - 151	Fort Douglas Univ. of Utah	6	4	short	L		--		C	FG	L
151 - 152.1	Salt Lake City	6	3	short	H	Land vegetation	13/14	No	C	FG	H
152.1 - 153.1	Salt Lake City	6	4	short	H	Land vegetation	13/14	No	C	SS	M
153.1 - 154.1	Salt Lake City	6	3	short	L		--		B	FG	M
154.1 - 157	Salt Lake City & I-15	6	4	short	L		--		C	SS	L
157 - 160	I-15	6	5	long	L		--		C (Heavily mod.)	FG	L

* 1 - Central Uintah Basin
2 - Western Uintah Basin
3 - River canyons
4 - Mountain valleys
5 - Wasatch front canyons
6 - Salt Lake foothills

** short term 1-5 years
long term more than 5 years

*** dash (--) signifies predetermined to be no change in class.

**** based on USFS plan and VQO rule

Please note:

Map No. 2 in this report is the same as Map T-1-2 in the Uintah Basin Synfuels Development EIS. If the map is missing here, please refer to the map in the EIS.

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